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Operations Research For Improved Delivery Of Health Services

Report Of The Task Force

MINISTRY OF HEALTH AND FAMILY PLANNING
GOVERNMENT OF INDIA
NEW DELHI

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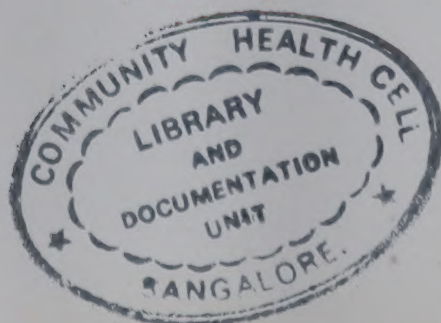
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CONTENTS

	<u>Page</u>
List of Tables and Figures	iv
Preface	v
Acknowledgements	vi
Composition of the Task Force	vii
CHAPTER 1 Introduction	1
CHAPTER 2 Critical Appraisal of Health Care Delivery System and the Studies Thereon	3
CHAPTER 3 Scope and Content of Operations Research in Health Services	11
CHAPTER 4 Problem Areas for Operations Research Studies and their Prioritization	15
CHAPTER 5 Administrative Machinery for Management Research	20
Appendix Annotated Bibliography of Operations Research Studies on Health Care Delivery System in India	30
Introduction	30
A. Technical Analysis of Health Services Systems and Sub-systems	33
B. Cost Analysis of Health Services Systems and Sub-systems	57
C. Cost Benefit and Cost Effectiveness Analysis of Health Service Systems	66

D. Materials Planning and Inventory Control	70
E. Waiting Line Studies	77
F. Health Manpower	83
G. Information System	94
H. Need and Demand for Health, Family Planning and Nutritional Services	97
I. General	101

LIST OF TABLES AND FIGURES

	<u>Page</u>
Table 1 Growth and Development of Health Services Organisations in India during 1950-51 to 1971-72	4
Table 2 Scales of Pay and Time Phasing of Creation of Posts for Management Research Division	23
Table 3 Approximate Annual Cost Estimates of the Proposals made - 1975-76 to 1978-79	27
Figure 1 Conceptual Model of Health Care Delivery System in India	7

PREFACE

It is said "to act one must understand; to understand one must enquire." This does happen in the practice of medicine and in the practice of administration. However, surprisingly enough, it has not been happening in the practice of health services administration. Keeping in view the problems and deficiencies with our health services systems, one definite way to improve the health service administration is, therefore, to rationalise the decision-making process, particularly at institutional levels, through operational analysis and studies.

The operational studies in health services carried out in this country are very few. They, however, demonstrate the need for such studies for improving the efficiency of health care delivery systems. It is quite opportune that Government of India, Ministry of Health and Family Planning are convinced of the need for such approach; and taken it upon themselves to encourage, initiate and fund such an effort in health services.

The Task Force members have been pragmatic in their approach to the terms of reference placed before them and down-to-earth practical in making recommendations with regard to each one of them. In their effort to be practical and as close to realities of life as possible, they have met a number of officials and non-officials; health administrators, health professionals and management specialists in Delhi and in the States and discussed different aspects of the terms of reference. It is hoped that the resultant output, in the form of this report, would lead to concrete action so as to be of ultimate utility to health services in this country.

NEW DELHI
DECEMBER 12, 1974

A. TIMMAPPAYA
CONVENER

ACKNOWLEDGEMENTS

The Convener and members of the Task Force acknowledge, with deep sense of gratitude, the privilege bestowed on them by the Government of India, Ministry of Health and Family Planning, to suggest specific action measures with regard to Operations Research for Improved Delivery of Health Services. They are particularly grateful to Dr. Karan Singh, Minister for Health and Family Planning for the interest shown and esteemed advice given by him.

The Task Force takes note, with gratitude, of the valued co-operation, support extended and willing acceptance of the brunt of hard work borne by Shri T.J. Ramaiah who was nominated as the Rapporteur of the Task Force. They are thankful to Dr. A. B. L. Srivastava for his participation in the discussions of the Task Force and valuable suggestions towards fulfilment of the objectives set before them.

The contribution of Shri V. Rama Rao and Shri Vinay Kapoor, Research Assistants, in the preparation of Annotated Bibliography of Operations Research Studies in Health Care Delivery Systems in India is commended. The Task Force also acknowledges the excellent secretarial assistance by Miss G. Sandhya Vani.

The Task Force will be failing in its duty if it does not acknowledge with gratitude the host of knowledgeable health professionals, administrators, management specialists, in and outside the health care system, for sparing their valuable time and ideas which were of immense benefit in the work of the Task Force.

NEW DELHI
DECEMBER 12, 1974

A. TIMMAPPAYA
CONVENER

COMPOSITION OF THE TASK FORCE

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CHAPTER I

INTRODUCTION

1.1 The National Committee on Science and Technology in their report on "Policy for Science and Technology in India" for the Fifth Five Year Plan, emphasized the need for and recommended Operations Research studies for improved delivery of health services. These recommendations having been accepted by the Government of India, Ministry of Health and Family Planning (Department of Health) a Task Force on "Operations Research for Improved Delivery of Health Services" was constituted by the Ministry vide their order No. Z. 14011/1/74-RISM dated 23rd July, 1974, to suggest specific action measures with regard to the following terms of reference:

- a. To review and critically analyse the studies already undertaken in the Operations Research field by the various agencies;
- b. To identify problem areas for Operations Research work and their prioritization;
- c. Organisation of the Operations Research group in terms of staffing, functions, its location in the Central Ministry of Health etc. ;
- d. Modus Operandi of the Operations Research Scheme in terms of specification of activities to be performed within a defined period of time, mechanical data processing facilities, external assistance (say, WHO) etc. required, creation of Consultative Committee for overseeing the activities of this group and advising etc. ;
- e. Working of the economics of such a proposal in terms of costs involved; and
- f. To recommend steps ~~for~~ promotion of Operations Research Work in health services.

1.2 During the process of their deliberations, the Task Force members interviewed 42 knowledgeable professionals, in the health care system at New Delhi and in the States, administrators and management specialists. In addition, a partly structured schedule was mailed to 76 Directors and officials of State Health Services, Directors and officials of training and research institutions in health services. The responses were received from 25 persons out of the 76 to whom these were mailed. The responses thus received were analysed, the results of which formed a basis for the deliberations of the Task Force.

1.3 The first meeting of the Task Force was held on 5th August, 1974. The same was inaugurated by Dr. Karan Singh, Union Minister of Health and Family Planning. Subsequently, they met four more times during the next three months. The first meeting was mainly devoted for evolving the strategy for work concerning the terms of reference. The different terms of reference were discussed during the next three meetings. The last meeting which was held on 25th November, 1974 considered the draft report placed before them and approved the same.

CHAPTER 2

CRITICAL APPRAISAL OF HEALTH CARE DELIVERY SYSTEMS AND THE STUDIES THEREON

2.1 During the pre-independence era, it is reported (Bhore Committee, 1946) that the level of health in India, on the whole, had been very low as evidenced by the large amount of preventable morbidity and mortality. The death rate and infant mortality rate during the period 1941-51 were 21.4 per 1,000 population and 161 per 1,000 live births. The average annual number of deaths in India during the same period from epidemic diseases like Malaria, Cholera, Small-pox, Plague etc. was of the order of about 19,00,000.

2.2 There were about 8,600 hospitals and dispensaries in the country of which about 5,200 institutions were located in rural areas and the rest were in urban areas. The total number of hospital beds was of the order of 1,13,000 of which only about 30,000 were located in rural areas. Thus, before independence the country had only one hospital bed per 4,000 population, on an average, or 0.25 bed for 1,000 population; and one medical care institution, on an average, for every 28,000 urban population and one for every 43,000 rural population.

2.3 After independence, the planned development of health services through Five Year Plans was initiated in 1952. There had been a rapid growth and development of health services in terms of its organisation, its geographical spread, and health services activities,

Community Development Blocks emerged from the philosophy that a substantial change in the desired direction for social and economic development can result primarily through the active involvement, participation and sharing of responsibilities of the people at grass root level; and supplementing the governmental efforts with those of the community resources. All developmental activities through five year plans were to be planned and delivered, including Basic Health Services, through these community development blocks. The Primary Health Centre with its three sub-centres (later

increased to six to eight) integrated into Community Development Block movement, was envisioned to be the focal point for delivery of comprehensive integrated curative and preventive health services in rural areas. Each primary health centre was to be established for a population of 80 to 100 thousand population and a sub-centre for every ten thousand population. Thus, over the last twenty-two years of planned development, a huge organisational structure came into being with 5, 195 PHC's and 32, 218 sub-centres spread over the country for delivery of health services in rural areas. Each PHC complex is staffed by 60 to 70 health workers of different categories.

During the same period, there has been, on the other hand, phenomenal growth of other health institutions like hospitals, dispensaries and training facilities for different categories of health workers. Table 1 presents a comparative picture, for certain key components, of such growth in health organisations over the period.

TABLE 1

GROWTH AND DEVELOPMENT OF HEALTH SERVICES ORGANISATIONS IN INDIA DURING 1950-51 TO 1971-72

Item	1950-51	1960-61	1971-72
Number of Hospitals and Dispensaries	8, 600	12, 000	14, 438
Number of PHC's	-	2, 800	5, 195
Number of Sub-centres			32, 218
Hospital beds	113, 000	185, 600	298, 304@
Number of Medical Colleges	30	57	99
Annual admissions to Medical Colleges	2, 500	5, 800	12, 526
Doctors	59, 000	70, 000	138, 000
Nurses	17, 000	27, 000	77, 824@

@ for 1970

Source: Central Bureau of Health Intelligence, DGHS, Government of India.

Further, with the Governmental concern for the menace of communicable diseases like Malaria, Small-pox, Tuberculosis etc. and, later with the explosive population growth, a number of vertical health programmes came into being, for their control/eradication.

A substantial amount of thinking and effort has gone into the development of health services throughout its developmental process. The inspiration and motivation for such developments may be said to have come through the valued recommendations of expert committees like Mudaliar Committee, Chadha Committee, Mukherjee Committee and Multi-Purpose Worker Committee which have examined the working of the health systems in the country.

2.4 However, at aggregate level, its development has continued to rest primarily on empirical judgements rather than hard data generated from the field, pertaining to different aspects of health services including its very strategy. They greatly lacked experimentation with new ideas pertaining to development of strategies, development of operational systems and sub-systems to be able to maximise their productivity within the available resources. They have been conditioned by conservatism rather than develop an approach based on radicalism in thinking and innovation arising from scientific evidence. The imbalances in the provision of health services between rural and urban areas continued to persist.

The concept of integrated health services, to be delivered through the Primary Health Centres in the rural areas, has undergone modifications with the addition of number of vertical health programmes. Further, the very concept of integrated health services, particularly in relation to family planning, maternal and child health and nutritional services, has continued to elude application in practice. Though it has been vigorously subscribed in principle, the health care organisations have continued to remain away from the modern developments in organisation and management of social organisations.

The medical professionals, who are entrusted with the primary responsibility of managing the health services have been by far ill-equipped to perform the job. They have continued to struggle with the self perpetuating role conflict between the practice of medicine on one hand and the practice of administration on the other, leading to many shortcomings in the delivery of health services.

2.5 The entire spectrum of health care delivery system encom-

passes wide range of policies and programmes. Understanding in terms of the same (i) the inputs and the processes that go into them for the production of required services and bringing about possible reductions in morbidity, mortality and disability in the community, and (ii) their inter-relationships, would be greatly facilitated through the examination of the conceptual model of health care delivery system presented in Figure 1.

The system (Health Services Organisation) that is entrusted with responsibility of delivering certain pre-determined services necessarily require various types of inputs such as different categories of trained personnel, drugs, medicines, vaccines, different types of equipment, technology based on researches etc.

2.5.1 A large number of such institutions exist in this country to generate the inputs. But, there has not been proper correspondence between the production of inputs and their consumption in the health services organisation. The findings based on the studies carried out in health services systems point towards this lacuna. Some of the studies (F-7, 8 in Appendix 1) show that there has been considerable increase, for example, in the medical manpower during the last 22 years of development, there do exist acute shortages at some levels. However, on the other hand, many graduates coming out of medical colleges struggle for want of placements, for a variety of reasons. It is known that while some States do have the shortage of auxiliary nurse midwives, some others have an excessive supply of the same. Further, some of the studies (F-9, 10, 13, 16, 17) show that while a particular category of health personnel is expected to do certain jobs, their actual job performance is in variance with what is prescribed. In peripheral health services all categories of the health workers are idle to the tune of about 40 per cent of their time, while about 15 to 20 per cent of their time is spent in travel (A-10, 20, 21; F-18, 19). Thus a gap exists between the production of health manpower in required quantities and their appropriate allocation to the health services organisations. There have been shortcomings in laying down the specific activities to be performed by each of them, in continuous supervision and evaluation of their jobs so as to bridge the gap between what is to be done and what is actually being done.

The studies that have been carried out with regard to the existing patterns of utilisation of resources in hospitals, show that there has been substantial amount of under/inappropriate utilisation of physical facilities such as operation theatres, hospital beds etc. (A-2, 3, 9, 11, 15, 24, 25, 26, 28, 30, 31, 34); ill-planned or inadequately designed systems for outpatient services (E-1 to 8);

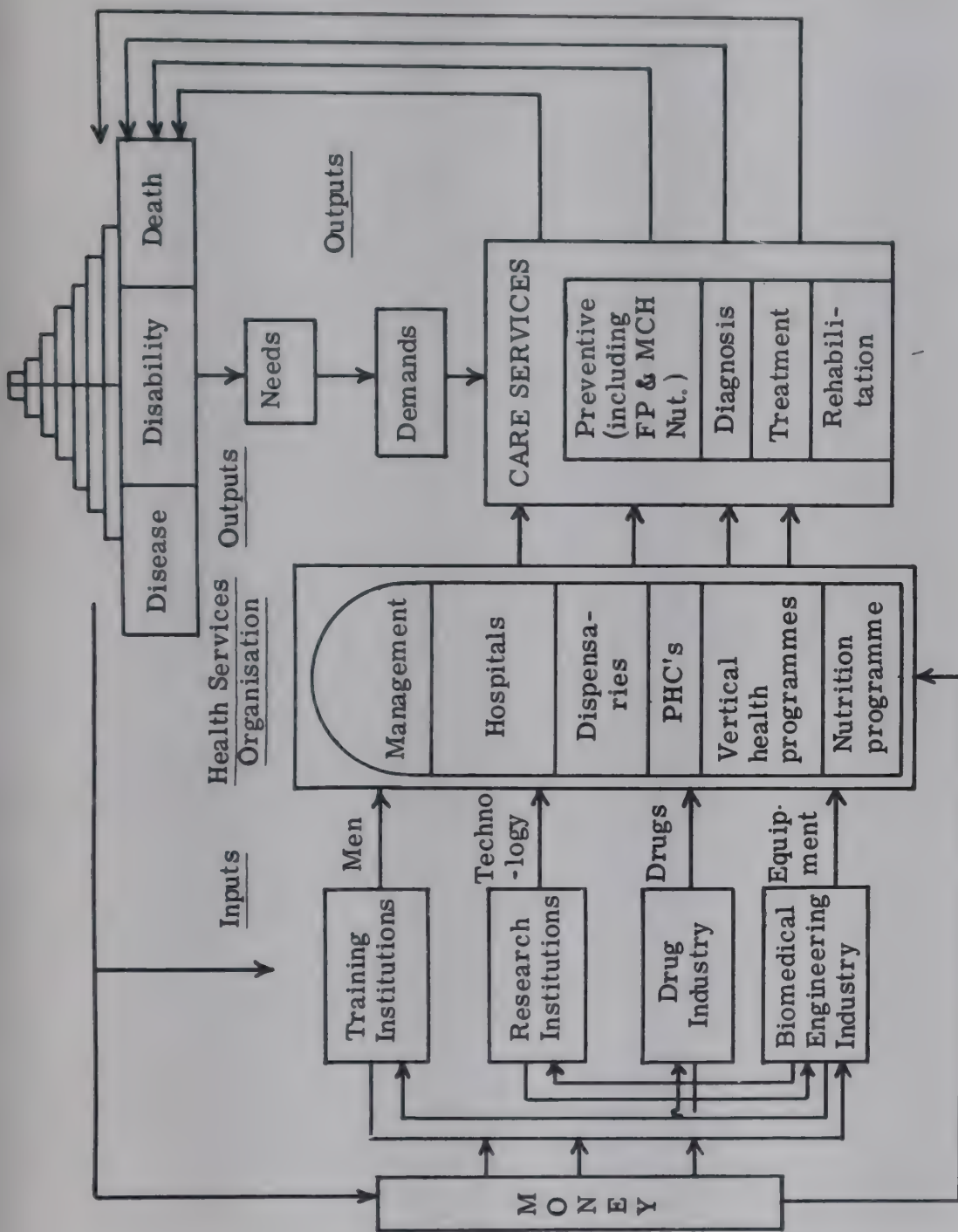


Figure 1: Conceptual Model of Health Care Delivery System in India

and for purchase, store, retrieval and dispensing of different types of medicines, drugs and such other materials (D-1 to 11). Further, the type of equipment used and their management is far from satisfactory. While much of it is imported or based on imported technology, proper facilities for their preventive maintenance and repairs are lacking. An estimate goes to show that the equipment being unutilised for want of repairs etc., when commissioned to work, would be more than adequate to meet the needs of ten new medical colleges (Jain Committee Report 1968). The studies on cost analysis point out that while a patient-day costs as low as Rs. 18 in one hospital, it is as high as Rs. 60 in some other (B-5, 7, 10, 12). Further a study (A-25) based on 23 large non-teaching general hospitals show that their inpatient facilities are being used mostly by people within a radius of five kilometers.

The large majority of the studies in hospitals are, however, carried out in few of the Delhi hospitals. However, based on the evidence available from hospitals outside Delhi, though limited in nature, there is no reason to disbelieve that the situation could be different in majority of other hospitals in the country.

2. 5. 2 In spite of investing large amount of money on rural health services, the shortage of services has been a perpetual problem to the administrator. The available evidence (A-10, 20) show that the existing services in a primary health centre are utilised by population living within a radius of three miles. Further, though there has been fairly well chalked out programme for home visiting, the quantity and content of home visiting has been of considerably low order. As a result, though vast resources are being spent in the rural areas for delivery of health services, it has not been known as to what is their effectiveness in containment of disease, disability and death, except that they are expressed in general terms, that too for certain specific diseases for national control/eradication disease programmes (C-1, 3, 4, 6, 7, 9).

2. 5. 3 Though adequate scientific evidence with regard to the functioning of rural health services is not available, it is generally known that their functioning has been far from satisfactory. However, during the last few years, fairly large experimental and/or service projects have come into being to systematically analyse its functioning.

The notables amongst the experimental studies are District Health Administration Research Project, Rohtak (A-20, 21), Functional Analysis of Primary Health Centres (A-10) in Punjab, Experimental Multi-purpose Health Worker Project at Miraj and Project-POSHAK (A-33).

On the other hand, notables from amongst the service-cum-experimental projects are Medical Manthan Scheme in Punjab, Health Co-operatives in Kerala, Health Assistants Scheme in Rajasthan, Mobile Hospital Scheme of Government of India, Insurance-cum-service approach scheme for rural areas of Voluntary Health Services (VHS) in Madras and World Bank Projects for integrated health, family planning, maternal and child health services in the States of Uttar Pradesh and Karnataka.

The results of most of these projects are not available, except those of Rohtak Project which have helped in some way to shape the recent policy decisions in favour of the multi-purpose worker strategy as opposed to the present uni-purpose worker.

While some of the studies, in progress for few years, have not been able to provide useful data for decision making, some others are just in their infancy. Most of them, however, are of long gestation periods. Further, keeping in view location of the projects and the coverage of the project objectives, it is doubtful whether they would be able to generate generalisable results.

2. 5. 4 However, in their concern for and eagerness to bridge the gap between the supply and demand for health services, the Government are forced to take major policy as well as implementation decisions without adequate scientific evidence. They pertain to strategy, priorities and allocation of resources on one extreme of the continuum and control decisions on the other. Further, varieties of additional resources are available in rural areas such as indigenous practitioners of medicine. The feasibility and extent of their involvement in the delivery of health services, the strategy for such involvement etc. are again questions which have been bothering the decision makers at different levels.

2. 5. 5 While theoretically it is known that the primary health centres, dispensaries and hospitals are set up to render differential components of services, the major emphasis in most of the institutions has been on curative services rather than preventive services. There has not been a linkage in these institutions which are located differently and with differential quantum of resources and functions. As a result, there has been considerable amount of duplication in the resources made available to them and in their utilisation.

2. 6 What has been briefly discussed in the preceding paragraphs is merely a dispassionate look at our health services in the light of the findings of available operational studies; and not aimed to project a dismal picture of the same. There are many problems. Some pertain to larger systems such as the strategy; planning of appropriate resource requirements and their allocation; appropriate

linkage between different institutions; exploration and involvement of community resources in the formal health care system etc. On the other hand, there are a number of problems pertaining to activities and processes in each of the many sub-systems which are of a micro nature.

Operations Research has been known to be a powerful approach, with number of techniques therein, essentially for the purpose of development of systems such that there is appropriate correspondence between the inputs and the outputs of the system. However, its effectiveness is known to be far greater in sub-systems, that too, at an institutional level than in system-wise applications.

CHAPTER 3

SCOPE AND CONTENT OF OPERATIONS RESEARCH IN HEALTH SERVICES

Operations Research is a pragmatic and eclectic discipline developed out of the need during World War II for assistance in making optimal decisions. After the war, it has found important applications in the industry as well as in all activities of public administration including health services.

Operations Research makes use of scientific methods of analysis in decision making process i. e. in selecting the best course of action, when the complexity of administrative issues makes intuitive solution difficult to arrive at. It does not replace intuition, but seeks to supplement the same. It emphasizes the objectives of the whole organisation in circumstances where management decisions would result in unequal benefits to different components of the organisation. Through use of appropriate quantitative measures, it attempts to trade off advantages against disadvantages in order to arrive at an optimum solution to a problem under a given set of circumstances; for example, attempting to optimize the idle time of facilities and waiting time of patients in ambulatory care facilities. It is an effort to substitute the analytical processes for hunch; and objective measurement for discretion in the decision making process. The optimal solution which is the goal of Operations Research work is defined in terms of the total set of objectives for a given operation, that is, minimisation of cost or maximisation of benefits. Thus, it is "the application of scientific methods, techniques and tools to problems involving the operations of a system so as to provide those in control of the system with optimum solutions to the problem¹."

Operations Research is a part of current world wide

1. Churchman, Ackoff, Arnoff "Introduction to Operations Research" Wiley, 1957.

"management science" movement which provides an important avenue for increasing the executive's ability to generalise. It is concerned with both short and long range planning, though at present it is more effective in short range circumstances. Nevertheless, it attempts to establish whatever relationship that exists between an organisational objective and its resources, thereby cutting across the traditional areas of management. However, it neither avoids nor overlooks the effects of behavioural problems which are paramount in health services even though such problems cannot always be formulated or measured quantitatively.

In summary, it can be said that Operations Research is essentially a planning effort. It helps to understand the system. It helps to regulate the processes and in formulating certain ennobling rules for action. This is done through certain scientific processes, the steps of which are spelt out below²:

1. Choose the objectives (with particular reference to the problem under consideration); specify its dimension and value.
2. Isolate all of the variables that are pertinent to the attainment of the objective value, i. e. the relevant independent variables.
3. Develop the relationships that exist between the independent variables.
4. Distinguish controllable variables (which can be part of the strategy) from non-controllable variables (classifying the later as either states of nature or competitive strategies).
5. Develop forecasts and predictions for the non-controllable variables, which should be treated as states of nature. Those variables which have (rational) intelligence behind them must be treated separately by game theoretic methods.
6. Determine whether the forecasts and predictions are based on stable process. This determination can be intuitive but powerful methods of statistical quality control are available to assist.

2. Miller and Starr. Executive Decisions and Operations Research Prentice-Hall, 1969.

7. Develop the function that relates the independent variables to the dependent objective variable.
8. State the restrictions that limit the possible values of controllable variables.
9. Choose those values of the controllable variables (i. e. that strategy) which promise to maximise the degree of attainment of the objective, within the limits set by the restrictions.

In performing this function, it does not meddle with the real life systems. It attempts to build a model, however, of the real life system and experiments with the model to evaluate the effectiveness of alternate courses of action.

In the area of health services, the administrator should have clear long range perspective for the development of facilities for delivery of health services. Operations Research helps in developing highly inter-related time-dependent plan for such a long range perspective. After having identified specific programmes/activities to be performed, the next question is the allocation of available resources between various programmes and/or activities which again is facilitated through Operations Research approaches. After having allocated the financial resources to programmes/activities, the administrator will have to think in terms of choosing an optimal strategy, out of the number of alternatives available to him, for the delivery of services, for example, domiciliary versus institutional care. At the same time various types of resources such as manpower, equipment, medicines and drugs etc. etc. have to be planned and made available, when actually needed, for the purposes of implementation of various programmes such that the total activity moves as integrated package of programmes/activities and resources/inputs. In all these efforts and in evaluation and monitoring of the programmes/activities continuously, through active feedback loops such that the required changes are brought about in the processes as and when called for, extensive uses of Operations Research can be found.

In the short term planning processes, in terms of planning for location of facilities, estimation of need and demand and for resources, development of policies and procedures for getting the facilities into operation i. e. essentially developing an operational system such as inventory system for medicines and drugs, an outpatient scheduling system, diet planning, scheduling of surgical operations, allocation of resources (say, beds) to different departments, etc. etc. in a given facility fall within the purview of

Operations Research work in addition to developing management information systems.

Health Services sector is highly labour intensive, that too of costly professional manpower. Effective planning for different categories of workers including the determination of their optimal mix for performing a given set of activities is of paramount importance. Extensive applications of Operations Research of this nature and of different sorts are available in the literature elsewhere. The results of many of the studies have been actually utilised for improving the systems.

It would, however, be worthwhile to give a word of caution. Operations Research is no panacea for all problems. One major difficulty in conduction and implementation of Operations Research, particularly so in health services, is the involvement of value judgements in the specification of objectives. It becomes all the more difficult to specify the objectives in view of the diffused decision-making process in our Governmental working. Therefore, it should not be assumed that it would solve all problems. Over enthusiasm in this regard is likely to lead to disappointment and frustration. It is only a scientific tool in the hands of the administrator. The human being behind the tool should not be forgotten in terms of its use and abuse; success and failure. The effectiveness of Operations Research could be improved by bringing in other modern management techniques, particularly those having a bearing on the human relations and motivation such as Organisation Development (OD).

In the light of what has been stated, it is, therefore, highly relevant that the National Committee on Science and Technology should have emphasized on pilot studies and Operations Research for the implementation of health programmes, in addition to studies on the most economical combination of various types of health services; the area and population to be covered by health workers; the problems related to health intelligence and collection of accurate statistics; assessment of cost-benefit ratios etc. Further, the need to evolve a national policy for health manpower development including the development of much talked about subject of community oriented physicians and health assistants is very appropriate and timely.

CHAPTER 4

PROBLEM AREAS FOR OPERATIONS RESEARCH STUDIES AND THEIR PRIORITIZATION

4.1 In the light of what has been discussed earlier, the Task Force identified a large number of components in the health services system, which need to be subjected to Operations Research.

It so happened that while some of the studies were under the purview of Operations Research, some others (almost 40 per cent) were pertaining to behavioural aspects within the organisations. While, studies on organisational behaviour are very important and constituted the other side of the coin for bringing about 'change', the Task Force carefully selected only those studies relevant in the present context.

4.2 Micro Studies: Out of the studies, thus selected, there are a number of problem areas which are of micro nature. These studies are with respect to the understanding of the processes involved in and development of better designs for sub-systems at an institutional level. They are amenable to rigorous Operations Research methods and techniques and involve comparatively few uncontrollable variables which, however, can be predicted appropriately. The results of such micro studies would be reliable and effects perceptible within a short span of time. Their immediate applicability to bring about improvements in the organisational productivity is high. The Task Force, therefore, attaches highest priority to micro problems of this nature to be subjected to Operational Analysis. A list of priority problem areas for such a micro analysis is given below. It is to be noted that, in view of the importance of each of these studies, further prioritization is not attempted. Therefore, the order in which they are presented does not in any way place differential emphasis on each one of them. However, keeping in view the needs and problems of individual institutions, further prioritization may be attempted at implementation stage.

1. Activity analysis of various categories of workers in the health care system.
2. Studies towards determining the norms of work-load in terms of quantum and range of services to be provided, population to be covered etc., for different categories of health personnel at all levels.
3. Studies on rationalization of staffing patterns keeping in view the work-load.
4. Utilisation and maintenance of physical facilities, equipment and vehicles in all the institutions of health care system.
5. Utilization of hospital beds.
6. Studies on waiting time problems in hospitals and health centres.
7. Studies for development of systems for indenting, storage and retrieval of medicines and drugs (inventory control and materials planning).
8. Studies for optimal scheduling and deployment of vehicles (net work) for rural health services.
9. Studies for scheduling and deployment of vehicles for emergency services.
10. Scheduling of patients in outpatient departments of hospitals and health centres.
11. Scheduling of Operation Theatres.
12. Inventory control system for X-ray, Laboratory materials, shoe stores, blood bank etc. in hospitals.
13. Diet planning in hospitals.
14. Studies on allocation of resources in terms of beds, nurses, Operation Theatre time etc. to different specialities.
15. Cost analysis of health care activities.
16. Cost analysis of different hospital services.

17. Cost of training of different categories of health workers including professionals.
18. Economies of scale in hospitals, medical colleges and schools for nursing and other categories of health workers.
19. Cost-benefit analysis and cost-effectiveness analysis of hospital services.
20. Cost-effectiveness analysis of different training programmes.
21. Studies towards development of suitable management information systems for individual hospitals and health care institutions.
22. Feasibility studies for introducing performance budgeting.
23. Studies in quality of health care services towards development of standards for quality of health care.
24. Studies in quality of medical care in hospitals.
25. Patterns of private expenditure on health care services by the population.
26. Studies on optimum span of control for different levels of health services organisation. ✓

✓ 4.3 Macro Studies: On the other hand, there are some important problem areas for study which are of macro nature. They require fairly large amount of resources; and involve long gestation periods for experimentation and for the results to be available. In addition, these studies involve a number of assumptions as a result of a number of uncontrollable variables. Therefore, they are quite likely to suffer for want of generalizability and lack of immediate applicability for bringing about system-wide changes. A list of such problem areas is as given below:

1. Diagnostic and experimental studies for the development of health care organizational system(s) best suited for delivery of integrated health, family planning and nutritional services to rural populations. Certain strategies for this purpose are -

- i. Multi-purpose workers versus Uni-purpose workers.

- ii. Feasibility and extent of involvement of rural private practitioners in community health care.
 - iii. Feasibility and extent of involvement of chemists and druggists, teachers, village social workers in community health care.
 - iv. Institutional Care versus Home Care; Mobile Vans versus Camp Approach.
 - v. Graded payment versus no payment for services.
2. Development of a system of referral services.
 3. Studies towards understanding of organisational and extra-organisational variables influencing the output in health, family planning and nutritional services.
 4. Cost-benefit analysis and cost-effectiveness analysis of community health care.
 5. Cost-benefit analysis and cost-effectiveness analysis of disease control/eradication programmes.
 6. Studies towards development of a suitable management information system for the total health care system.
 7. Patterns of behaviour in seeking health care by the people.
 8. Attitudes and perceptions of the people towards health services (formal and private).
 9. Existing status of private practitioners (of all systems) in the provision of medical care; their location, quantity and quality of services provided etc.
 10. Studies of supply and demand for different categories of health manpower.
 11. Studies on training needs of different categories of manpower, technical and managerial.

Some of these problem areas for study are very important. Their commissioning, though should be subject to the availability of finances. However, the Task Force makes certain recommendations in this regard, namely,

- i. Certain major studies are already under way as has been pointed out in the earlier chapters. The components, not included in them but carefully selected, may be subjected to investigation at selected centres through the participation of appropriate organisations.
- ii. Many medical colleges in the country do have rural field practice areas attached to the Departments of Preventive and Social Medicine, with certain additional resources and know-how. Selected such centres serve as potential areas, in addition to others, for field studies and pilot experimentation. They may be strengthened with know-how available in institutions such as NIHAIE, NIFP, ICMR, NIN, NTI and the like, as active participants in field research/experimentation.
- iii. Initial emphasis may be on diagnostic and exploratory studies leading to careful selection of appropriate variables for experimentation.
- iv. These studies may be carried out as co-ordinated researches with uniform concepts, principles and methodology; and built in flexibility to make changes depending upon the local needs.
- v. The Advisory Committee and the Management Research Division, recommended for creation elsewhere in this report, should be actively involved in the total process of selection of problems for study, methodology, funding etc.

CHAPTER 5

ADMINISTRATIVE MACHINERY FOR MANAGEMENT RESEARCH

5.1 It has been the experience that there does exist a gap between conducting a study and utilization of its findings for improving the system. Since Operations Research studies are primarily action-oriented, their usefulness lies only in the utilisation of the findings and the implementation of the systems designed, with facilities for continuously monitoring and bringing about further improvements. Towards this end, the Task Force recommends that there is an urgent need for the creation of a small machinery in the Central Ministry of Health and Family Planning to be called 'Management Research Division'. This division, during the first few years of its existence, would concern itself primarily with operations research studies. It is however, visualised that this division eventually should take on broader research responsibilities to cover not only the operations research studies but also behaviourally-oriented management studies having bearing on organisational productivity.

5.2 Management Research Division: The functions of this division should be concerned primarily with micro studies. They are -

- i. To act as a catalytic agent in initiating and conducting Operations Research studies and implementing their results.
- ii. To help in identifying the changing needs for Operations Research studies as they emerge.
- iii. To commission and fund Operations Research studies.
- iv. To conduct studies subject to the constraint of availability of time.

- v. To collect, collate and disseminate information pertaining to different operations research studies carried out, the result obtained, improvements that were made possible in the organisational productivity as a result of the studies etc. In other words, to perform the function of a 'clearing house' for management research.
- vi. To render management consultancy services to Government health care institutions.
- vii. To help evaluate and monitor management processes.
- viii. To collect and direct experiences for promotion of Operations Research work in health services.
- ix. To develop framework for Operations Research studies in terms of concepts and methodology for such work.

The Task Force further recommends that the following measures be taken so that the Management Research Division is able to perform the assigned functions effectively:

- i. It should be attached to the policy decision making level in the Ministry of Health and Family Planning, Government of India.
- ii. The person who heads the division should enjoy the confidence of and have the support from the policy decision making levels.
- iii. A member of the division would represent on the study team of important studies.
- iv. As far as possible, the studies should be conducted by other management agencies/institutions. Management Research Division would, however, conduct some studies on its own.
- v. It should have the facility to attend scientific conferences and meetings so as to be in constant touch with changing trends in Management Research.

5.3 Advisory Committee: Keeping in view the difficult roles the Management Research Division is expected to perform, and fulfil the same to the best advantage of health organisations for improved delivery of health services, the Task Force recommends that a part-time advisory committee be constituted to advise on the functioning of the Management Research Division. Further that -

- i. the advisory committee will consist of official and non-official members, preferably with the Secretary to Government of India, Ministry of Health and Family Planning, as the Chairman,
- ii. the Director, Management Research Division would act as the Member-Secretary,
- iii. the disciplines represented in the Advisory Committee should include Health Services Administration, Public Administration, Operations Research, Economics, Organizational Behaviour and Training and Education, and
- iv. the size of this Committee would be about nine and the members should be carefully selected, preferably, from amongst those who have an active interest in delivery of health services and an understanding of and appreciation for the problems involved.

5.4 Staffing of Management Research Division: The Management Research Division would be headed by a Director of the status of Senior Deputy Secretary to Government of India, assisted by two Deputy Directors of the status of Under Secretary to Government of India and four Research Officers. Table 2 presents the recommended scales of pay and time phasing of the development of Management Research Division.

In addition, however, the division would have the support of adequate secretarial staff.

5.5 Functions and Qualifications

5.5.1 Director

- i. He should have good understanding of and appreciation for Operations Research particularly so in health services systems.
- ii. He should be able to provide dynamic leadership to the team so that this division can function as a catalytic agent for initiating and conducting of studies and the implementation of results.
- iii. He would help in identification of study areas and in determination of priorities.

- iv. He would initiate action and commission management researches.
- v. He would be responsible for the 'selling' function and promotion of Operations Research work in health services.

TABLE 2
SCALES OF PAY AND TIME PHASING OF CREATION
OF POSTS FOR MANAGEMENT RESEARCH DIVISION

Designation	Scale of Pay*	Total posts	Time phasing for creation			
			1975-76	1976-77	1977-78	1978-79
Director	Rs. 1800-2250	One	One	-	-	-
Deputy Director	Rs. 1200-1800	Two	One	One	-	-
Research Officer	Rs. 700-1300	Four	Two	Two	-	-

*Revised

5. 5. 2 Deputy Directors

1. Functions

- i. They would assist the Director in all his day-to-day activities.
- ii. They would serve on important studies as links between research team and the organisation on one hand and the Management Research Division on the other.
- iii. They would plan and conduct researches to be undertaken by the Management Research Division.

2. The Recommended Qualifications

- i. Good Master's degree in Operations Research with adequate background in Statistics or a good Master's degree in Statistics with adequate background in Operations Research.

- ii. At least five to six years of professional experience related to Operations Research in solving managerial problems.
- iii. Preference should be given to those who have Operations Research experience in health services.

5.5.3 Research Officers

1. Functions

- i. To collect, analyse and help prepare reports of the researches to be undertaken by the Division.
- ii. To collect, collate, store and retrieve information and experiences of studies carried out, funded or not funded by the Management Research Division.
- iii. Such other activities from time to time entrusted to or taken up by the Management Research Division.

2. Qualifications Recommended (for three posts)

- i. Good Master's degree in Operations Research or Statistics with specialisation in Operations Research.
- ii. Experience of Management Research is preferable.

For the Fourth Post

- i. Good Master's degree in Business Administration or good Master's degree in a Social Science with specialisation in organisation behaviour.
- ii. Experience of Management Research is preferable.

5.6 Funding of Researches: So far none of the health organisations whether at the Centre or in the States have any funds separately budgeted for management research; nor have any provision for such allocation whenever needed. It is, therefore, a considerable handicap for the organisations to commission any management research studies. The Task Force, after careful consideration recommends that -

- i. During the first few years, all such researches should be funded through Management Research Division.

- ii. It is the Management Research Division, in consultation with the organisations concerned and other appropriate authorities, decide as to the studies to be funded during a given year and make a separate provision for the same.
- iii. Individual health organisations should be encouraged to allocate certain percentage of their total expenditure for management research, as a separate 'head', such that the function of funding of researches is eventually transferred to the local levels from the present centralised system. This measure not only helps to accept and promote management research work in health organisations, for improving organisational productivity but also locates it appropriately since the type of micro researches, identified and emphasised are primarily concerned with the management function at the institutional level.

5.7 Other Facilities Recommended.

5.7.1 The Management Research Division is intended to deal essentially with quantitative data for analysis of system's processes/activities and for building up of models of the same to evolve optimum solutions. To facilitate this work, qualitatively and in its speedy completion, it is recommended that the division should be provided with -

- i. certain electrically operated calculating machines.
- ii. facility of 'time sharing' of computer. However, till such time this is available, it should have the provision for buying the computer's time for data processing as and when required.

5.7.2 To be in constant touch with the delivery of health services, with the professional and technical developments in the concerned disciplines and to remain in the main stream of management research, the Task Force recommends that the staff of the division should have the facility to travel, attend scientific conferences and seminars etc.

5.8 Time Phasing of Activities and Cost Estimates: Two major inputs essential for Operations Research activity as seen by the Task Force are finances for commissioning studies and a small Management Research Division.

During the first year of its activity, the Division would concentrate more on 'salesmanship' through practical demonstration of the usefulness of Operations Research based on the results. The number of studies to be carried out every year would go up gradually during the succeeding years.

It is estimated that the average cost per micro study of the type identified by the Task Force would be about Rs. 20,000. The average cost per macro study per year is estimated to be about Rs. 2.5 lakhs. The macro studies would, generally be of two to three years of duration.

The staffing of the division is also recommended to be phased out during the first two years along with other facilities such as calculating machines, computer based data processing time, cardex cabinets, filing cabinets and such other equipment and furniture.

The annual recommended outlays for this purpose are presented in Table 3.

One of the major questions which has engaged the attention of the Task Force is as to who should conduct the research studies. Keeping in view the importance of management of research function assigned to the new division recommended to be created with its minimal staff, the Task Force further recommends that the actual conduction of such micro studies should be entrusted to Management organisations available in country with adequate management research and consultancy know-how. Leading organizations identified for this purpose are -

- i. Administrative Staff College of India, Hyderabad.
- ii. Indian Institute of Management at Ahmedabad, Bangalore and Calcutta.
- iii. Indian Institute of Public Administration, New Delhi.
- iv. Indian Institute of Technology at New Delhi, Kanpur, Bombay, Madras and Kharagpur.
- v. Institute of Applied Manpower Research, New Delhi.
- vi. Institute of Economic Growth, New Delhi.
- vii. National Institute of Family Planning, New Delhi.

TABLE 3

APPROXIMATE ANNUAL COST ESTIMATES OF
THE PROPOSALS MADE (1975-76 TO 1978-79)

S. No.	Item	Cost estimates (in Rupees) for			
		1975-76	1976-77	1977-78	1978-79
1.	Funding of Specific micro O. R. Studies (a)	200,000	300,000	400,000	500,000
2.	Funding of specific macro O. R. Studies (b)	1000,000	1500,000	1500,000	1500,000
	<u>Management Research Division</u>				
3.	Salaries (c)	60,000	100,000	100,000	100,000
4.	Equipment and Furniture	30,000	15,000	10,000	10,000
5.	Computer Data Processing time (d)	10,000	10,000	15,000	15,000
6.	Travel	20,000	20,000	25,000	30,000
7.	Contingency (10 per cent)	12,000	15,000	15,000	16,000
	TOTAL	1,332,000	1,960,000	2,065,000	2,171,000

(a) based on an average cost of Rs. 20,000 per study and 10, 15, 20 and 25 studies would be carried out during I, II, III and IV years respectively.

(b) based on an average cost of Rs. 2.5 lakhs per study per year and 4, 6, 6, 6 studies during each of the four years.

(c) does not include the salaries of the secretariat staff like Stenographers.

(d) for 20 and 30 hours of computer time during each of the first two and the subsequent two years respectively, at the rate of Rs. 500 per hour.

- viii. National Institute for Training in Industrial Engineering, Bombay.
- ix. National Institute of Health Administration and Education, New Delhi.
- x. National Institute of Nutrition, Hyderabad.
- xi. National Productivity Council, New Delhi and its regional branches.
- xii. Statistical Quality Control Units of Indian Statistical Institute.

xiii. University Departments of Operations Research and Business Management.

There are also available a number of private management consultancy agencies for this purpose.

It is, however, recommended that the Management Research Division should carefully select an organisation based on the needs of a specific study and the costs involved.

5.9 Other Promotional Measures: Keeping in view the status of Health Services, constitutional and administrative; and the basic nature of Operations Research activity, the Task Force recommends certain important measures that would give an impetus to the successful implementation of Operations Research studies in health services. They are -

- i. Since the major constitutional and administrative responsibility for delivery of health services rests with the State Governments, the Central Government should persuade the States to create Management Research Division with similar staffing and functions in their respective health departments/ministries.
- ii. The style of management of Operations Research effort is the key to its success. If the results are to be organisationally effective, the problems must be identified and studied in conjunction with the users and not as isolated research studies, however, important they are.
- iii. Tacit understanding and agreement for implementation of recommendations based on Operations Research studies should be obtained.
- iv. Another approach, besides practical demonstration of usefulness of Operations Research through studies, to bring about positive change in attitude and appreciation, is through training. Therefore, National Institute of Health Administration and Education and such other management institutions should be encouraged to arrange training programmes in Operations Research/Management Research for all categories of health personnel, keeping in view their differential needs.

- v. Adequate authority must be vested with the Management Research Division to initiate management researches.
- vi. The staffing and composition recommended earlier for Management Research Division should be viewed as a 'Nucleus' to meet the short term needs of Operations Research. However, when its activities grow to encompass behavioural researches, bearing upon organizational productivity, this division should also grow keeping in view the later needs.

ANNOTATED BIBLIOGRAPHY OF OPERATIONS RESEARCH STUDIES ON HEALTH CARE DELIVERY SYSTEMS IN INDIA

INTRODUCTION

In the following pages is presented a fairly comprehensive annotated bibliography of Operations Research studies carried out in health services delivery systems in India. The term 'health services' is used in a larger context to include family planning, maternal, child health and nutritional services. The research studies carried out in health services are innumerable; some quantitative while others are not. Some are fundamental, some are technical, while some others are management oriented. The selection of literature for inclusion in this annotated bibliography, therefore, is based on certain criteria.

The definition of Operations Research adopted for this purpose, is "the application of scientific methods, techniques and tools to problems involving the operations of a system with optimum solutions to the problem". Operations Research, however, has certain distinctive characteristics which distinguishes it from other types of research, though it also essentially uses the principles of research methodology, as applicable for other types of research. Based on this definition of Operations Research, the criteria used for selection of studies are:

- i. The study should be concerned with some Administrative/ Management problem with accent on bringing about improvements in the effectiveness and efficiency of organisational system(s).
- ii. The study would concern itself with one or many aspects of the physical operations/processes of a system/sub-system.
- iii. The problem under consideration has alternative solutions, from the study of which the recommended solution would have emerged.
- iv. There is a recognition of the existence of input, process and output variables, and their inter-relationships.

- v. It should involve scientific measurement and quantification of the factors/variables involved.
- vi. The study may be descriptive or prescriptive but satisfies the earlier criteria.

Generally OR studies necessarily involve some sort of optimization for the choice of the best alternative. However, the studies did not employ optimization criteria but conform to the above definition and criteria are included.

In preparing the abstracts of the studies, the standard principles involved in their making have been taken note of. The abstracts presented are non-evaluative condensed description of the studies. They are not critical reviews. They are objective; impersonal and as neutral as possible. Expressions like "interesting", "significant", "judicious", "refreshing" which convey chiefly the feelings of the abstractor have been avoided.

Some of the abstracts included here are fairly long while some are comparatively small. Length of the abstracts obviously depend on the nature of the material. As a general rule, the studies which may not be significant have been given an annotation in a few lines. Research papers, thesis and monographs required longer abstracts but their length here does not exceed 500 words.

Each abstract begins with the full bibliographical entry. These entries carry the name of the author, title, dates, pagination etc. The abstract deals first with the objectives of the study. It gives a brief narrative of the methodology employed in carrying out the study. Further, the salient findings of the study along with some conclusions are highlighted.

This document contains abstracts of 131 studies. To make the reference easy, the abstracts have been classified into nine broad categories, viz., studies pertaining to:

- i. technical analysis of health services systems/sub-systems.
- ii. Economic analysis of systems and sub-systems.
- iii. Cost-Benefit and Cost-effectiveness analysis.
- iv. Materials Planning and inventory control.
- v. Waiting lines.
- vi. Health Manpower.

vii. Information system.

viii. Need and demand for community health care services.

ix. General.

However, there are some studies which could be classified under more than one category, where the best judgement of the abstractor has been used for their inclusion under a particular category.

At the end of this work, it was, however, felt that this work might not be all inclusive. It is hoped that this work would be continued in future to the benefit of health administrators, Operations Research workers and all others interested in and concerned with the delivery of health services in this country.

A. TECHNICAL ANALYSIS OF HEALTH SERVICES SYSTEMS AND SUB-SYSTEMS

1. Administrative Staff College of India. Report No. 3, Central Government Health Scheme. Ministry of Health and Family Planning, Government of India, March 1972, 22 p.

The objectivity-criteria for this report is ✓ minimum waiting time for the patients, improved doctor-patient relationship, built in accountability and control at all levels, performance evaluation of the dispensary as a whole, simplicity and clarity of the new system and cost and economy of the new system. ✓

Recommendations have been made on the various aspects of the new system. For regular dispensary systems, beneficiary cards within a dispensary are allocated to the medical officers on permanent basis. There will be only one prescription slip and restricted medicines are classified in the same manner as it is being done now. There is no restricted medicine counter. Bin-cards are introduced as an alternative system to fix control on dispensing of restricted medicines. Prescriptions are not to be taken by a patient when he leaves the dispensary after the treatment. Terminated cases are sent for registration and is done in the same manner as being done presently with certain modifications. For recording and reporting system, all running cases are maintained with the doctor. Disease and morbidity statements are prepared from the register, as it is being done now. For dispensary stores and inventory systems, the main features were as recommended in the Report No. 2. ✓ For staff utilisation, it has been found that average effective consultation time, average work load and effective utilisation of medical officers is very low. Uneven service due to domiciliary visits and wrong deployment of medical officers are the two reasons for building up of the queue. Certain recommendations have been made to overcome above difficulties as in Report 1. There is need for supervision and control. Patient rate is approaching a figure of 4 patients per 100 beneficiaries per day. There exist weaknesses in emergency services, domiciliary services and specialist services. It has been recommended to make

zonal organisation of CGHS activities in Delhi and all responsibilities should lie on the zonal medical officers. There should be performance evaluation of dispensaries and it should be carried out by a committee. It has also been suggested to maintain health records of each family in a folder to be used for references.

2. Anand, T.R. : Study of linen service in Delhi Hospitals including man-minute computation/work study of two processes of a mechanical hospital laundry. MHA Thesis, AIIMS, New Delhi, 1967, 140 p.

The linen services such as the development of linen and laundry services, its organisation, linen standardisation and specification were studied in five Delhi hospitals to suggest improved layout and design of the work place, improved use of materials, plants, equipment and manpower through improved working procedures for AIIMS hospital.

A questionnaire covering different aspects of the linen service was used as a guide for interview of the personnel involved. On the spot examination of the linen and laundry service was carried out in detail in terms of quality of services rendered and the problems regarding the same. Work study was also carried out in the mechanical laundry of AIIMS Hospital.

The findings of the study were related to organisation and management of linen service, cost of laundering, linen-requirements, specification, circulation, distribution of linen, condemnation and cost of linen service. No organised attempt seems to have been made at linen-standard specifications. Because of the lack of proper specifications the price of linen was found to vary considerably. The study suggests that a linen standardization committee should be set up to lay down the specifications of standard linen used in hospitals. Use of specific inventory control techniques is recommended so as to do away with shortages as well as surpluses. The study had made a number of recommendations in the light of its findings based on work study conducted at the mechanical steam laundry. Further measures that will reduce the unnecessary work, avoidable delays and thereby improving the efficiency of the entire system have been suggested.

3. Chistie, K.M. : Study of factors affecting the average length of stay of patients in the private wards Block at All India Institute of Medical Sciences, New Delhi. MHA Thesis, AIIMS, New Delhi, January 1973, 120 p.

The present study was carried out to determine the factors

which are likely to affect the length of stay of patients in the private ward of the hospital taking, average length of stay as the index of utilisation.

The material for study consisted of 351 patients; 276 admitted in the 54 private paying rooms and 75 admitted in 11 E. H. S. beds, all the patients admitted during a period of four months. Since all the medical records of past years with the required information for the proposed study were not available, a prospective study was thus undertaken, based on a proforma for collecting required information.

The study observes that the length of stay of 'paying patients' treated in the private ward was 17.88 days and that of the 'non-paying' Institute officers was 11.21 days. The bed occupancy rate was 95 per cent and 52 per cent respectively.

The length of stay increased with the increase in the number of investigations. The analysis by groups has revealed that the average length of the stay of patients with either the concomitant disease or complication alone was less than the average length of stay of patients who had both the concomitant disease and complications. The diseases for which EHS patients were admitted did not warrant prolonged inpatient care.

4. CIRTPC. A study on special Nutrition Programme in Delhi.
5. Caludius, K. Tewari: A study of staff health scheme at All India Institute of Medical Sciences with particular reference to Drug Cost. MHA Thesis, AIIMS, New Delhi, 1972, 130 p.

The objectives of the study are to study, the organisation and functions of the staff Health Scheme, the total coverage of the scheme and general characteristics of the population covered, the consumption of drugs under staff health scheme, morbidity pattern among staff health scheme beneficiaries and lastly to study other important aspects of the scheme in connection with hospitalization.

Data required for the same were collected from personal files of employees, different records and registers maintained in Employees Health Unit. The study findings led formulation of some suggestions for further improvement of the scheme.

6. Dubey, B. R., Roy, D. P., Bhattacharyya, S. C. and Bhuyan Kali: Work study report on the working of the laundry department of the All India Institute of Medical Sciences, MHA Thesis, AIIMS, New Delhi, 1969, 35 p.

The existing set up and functions of the Laundry Department of AIIMS Hospital were analysed by applying the principles of organisation. Layout techniques for suggesting better layout in the Laundry Department were considered. The team observed the operations relating to collection, washing, drying and distribution of linen to various wards and operation theatres. Information was also obtained through discussions with all the concerned officials.

It was found that, amongst others, there was no proper check and close supervision by the Engineering Department of the Institute to find out whether the steam boilers are supplying steam at the desired pressure of 75 lbs. per square inch; no proper check to safeguard that the required quantity of hot water from the hot water boilers at the required temperature was supplied for cleaning operations; no uniformity in the wards and operation theatres for sending dirty linen for washing. All the linen collected for washing purposes were boiled upto a temperature of 211° F without making distinction in the light, semi-dirty and heavy dirty linen. Procedures for collection of dirty linen and redistribution of washed linen were incongruent with the result that the two clerks available in the Laundry Department spend more than 60 per cent of their time in the collection and distribution of the dirty linen and supervision of the work of the Nursing orderlies. To remedy the ills of the present set up and functioning, the study team has made number of short and long term recommendations.

7. Gandotra, M.M.: Factors affecting Indian fertility in a changing set-up. Journal of Family Welfare, 1966, 12(4), 30-37.

The author provides a general review of factors influencing the reproductive span; birth spacing, and other aspects with notes on their importance in estimating future changes in India.

- ✓ 8. Ghei, P.N.: Study of Hospital infection in AIIMS with special reference to main operation theatre, maternity ward and the proposal for prevention and detection of the same. MHA Thesis, AIIMS, New Delhi, 1967, 145 p.

The problems of hospital infection, particularly staphylococcal infection in surgical and maternity wards were studied.

One thousand four hundred and thirty swabs were obtained for the isolation of staphylococci. The overall isolation rate of staphylococci was found to be 41.5 per cent. Fifty-six per cent showed haemolysis on blood agar plates of different gradation. About 55 per cent gave coagulase positive test. Mournitol fermentation showed that 60 per cent strains fermented between third and

fourth day. However, overall fermentation rate was 63.5 per cent.

Methods of safe and adequate sterilization and diligent maintenance of the general cleanliness of all areas in the hospital are important steps towards efficient and safer sterilising practices in a hospital. Strengthening of Central Sterile Supplies Department (CSSD); introduction of mechanised house keeping procedure in place of traditional brooms, mops etc.; and in provision of certain staff headed by an Infection Control Officer and advised by an Infection Control Committee, in addition to others.

9. Ghosh, B. N.: An exploratory study on midwifery practice of the local indigenous dais in Pondicherry and utilization of domiciliary midwifery services of a health centre by a semi-urban slum community. Indian Journal of Public Health, 1968, 12(3), 159-164.

Study undertaken to know the extent and the type of services mainly utilised from maternal and child health centre by the slum community. Reasons for non-utilisation of the services have also been investigated. Patterns and indigenous midwifery practices have also been studied and reported.

10. Gopalaswami, R. A.: Administrative Implementation of Family Planning Policy, Madras. Controller of Stationery and Printing, 1969, pp. 26. Also Population Review, 3: 43-62. Jan. 1959.

Author gives comprehensive account of the aimed targets in three five year plans. Delineates policy of Madras State regarding family planning programme, controversy over the application of methods. A family planning manual containing full information also formed part of the programme of the State.

11. Government of Maharashtra: The summary of the report of the Committee on the working of its teaching Hospitals for rationalisation of the Hospital Services, 1973-74.

The Government of Maharashtra appointed a Committee for Rationalisation of the Hospital Services under Government Resolution No. MCG/2573/H, dated 27th September, 1973. The terms of reference of the Committee were: (a) To go into all aspects of re-organisation of hospital services, including reduction of the staff that such reorganisation will necessitate; (b) To suggest to Government the changes and adjustments for streamlining the entire fabric of hospital services, so as to make it more useful for the Interns, housemen and Registrars and lastly; (c) Make recommen-

dations to Government for a more beneficial and efficient working of the Hospital, particularly for patient care within the limited resources available.

The work was carried out through detailed discussions with a number of individuals, including senior administrators, Medical Specialists, Scientists and others. The Committee points out that the major contributory factors resulting in the inefficient functioning of Hospital services were many, namely, lack of managerial abilities and skills of Senior Administrative Officers; total lack of financial administrative knowledge of the staff concerned; lack of penalty/incentive oriented system in the set up etc. The Committee has suggested certain detailed measures for (i) evolution and establishment of certain system of budget management and budget formulation, which has been successfully tested at some hospital on an experimental basis; (ii) the rationalisation of Teaching Units in terms of the staffing pattern of specialities and super-specialities, residents and residency programme, internship training etc. in addition to the need for training of Deans in hospital administration.

12. Gupta, J. P.: Factors affecting utilization of hospital beds. A study in surgical department of Safdarjang Hospital. Thesis for Doctor of Medicine in Community Health, University of Delhi, 1970, 115 p.

The present study has been conducted with a view to find out the factors which affect the average length of stay of patients of three surgical diseases, namely, Hernia, Appendicitis and Enlarged prostate admitted to Safdarjang Hospital.

The findings represent the prospective study and analysis of 272 cases of which 117 cases were suffering from Hernia of various kinds, 110 cases from Acute and chronic appendicitis and 45 cases from Enlarged prostate.

It was found that the average length of stay was 7.56, 7.47 and 19.80 in cases of Hernia, Appendicitis and Enlarged prostate respectively. The shortest length of stay was one day and longest length of stay was 30, 34 and 78 days in case of Hernia, Appendicitis and Enlarged prostate respectively. The length of stay in children less than 12 years was almost half of average length of stay for the entire groups of patients in case of Hernia and Appendicitis. In case of enlarged prostate, average length of stay increased with increase in age. A positive relationship between length of stay and severity of disease was seen only in case of Appendicitis. For all three diseases, the average length of stay increased with increase in number of investigations. Also it was found that more the number

of investigations after admission, the higher was the length of the stay. The average length of stay was high in case of emergency admissions as compared to routine admissions and elective operations. There were inter-unit difference in the length of stay. It has been shown that 35 per cent reduction in expenditure or provision of in-patient facilities to 63 additional patients for every 114 patients treated can be affected by certain measures.

13. Johns Hopkins University School of Hygiene and Public Health, Department of International Health. Functional analysis of Health Needs and Services (report of a research study), 1970.

14. Khanna, O. P.: Study of three Delhi Hospital Pharmacies with special reference to their physical facilities including a scrutiny of the practice of purchasing and inventory control of drugs at the AIIMS Hospital, New Delhi. MHA Thesis, AIIMS, New Delhi, 1968, 161 p.

The present study attempts to understand the different problems such as administration and that of supply of drugs and suggests remedial measures for the problems. This is a broad general survey of three hospital pharmacies in Delhi, with special reference to their existing physical facilities and record findings in the light of current concepts on the subject; and a special investigation of the existing practice of purchasing and inventory control of drugs at the AIIMS Hospital.

Brief visits were made to each of the hospitals to obtain preliminary information regarding the organisation and programme activities relating to drugs, on the basis of which a "standard work-chart sheet" was drafted which provided a framework for the subsequent detailed study. Data was collected by interviewing the medical superintendents, pharmacists and other workers, by study of circulars and available records.

The study observes that management of the hospital pharmacy is not very effective since each of the administrators had to deal directly with about 8 to 12 subordinates, some of whom are also heavily engaged in professional medical work thereby leaving little time to devote to planning, direction, control and co-ordination of purchasing, inventory control etc. of stores function. The study suggests some measures for economic and efficient operation of the pharmacy.

15. Kohli, B. R. and Goel, O. P.: Factors responsible for inter-state variation in Family Planning performance in India. National Institute of Family Planning, New Delhi, 13 p.

The paper deals with the wide variation in the performance under family planning programme among the States and also among different districts within a given State. It is understood that this variation in performance may have occurred due to the difference in the characteristics of States and their level of development. This variation may be attributed to demographic variables, socio-economic variables, administrative input variables and operation variables. The main objective is to identify above mentioned factors, which are responsible for the wide variation in the performance among States.

A multiple regression model is fitted to the data on performance, demographic variables, socio-economic and administrative variables. The operational variables are not taken into account due to the non-availability of quantitative information on the same. Performance data for six years 1966-67 to 1971-72 for each method of vasectomy, tubectomy, IUD and CC users are considered for its analysis.

The analysis shows that the socio-economic variables play an important role as compared to the other variables in the acceptance of family planning. The administrative input variables in the family planning programme do not seem to play a major role at the present level of economic development. All the demographic, socio-economic and administrative input variables taken together explain a very high percentage of variation present in vasectomy, tubectomy and CC users. Urbanisation, per capita income and average expenditure in family planning are found to be more important variables in raising the level of the acceptance of conventional contraceptives. The female education has more effect in raising the level of acceptance rates of all methods except vasectomy, where male education is found to have a more significant role.

16. Kohli, B.R., Sharma, B.B.L.: Aspects of Mass Vasectomy Camps in India. National Institute of Family Planning, New Delhi, March 1974, 12 p.

In this paper, an attempt is made to highlight the characteristics of the acceptors, and to study the organisation and management problems in organising Mass Vasectomy Camps. Various other aspects of the camps viz. high incentives, motivation, complaints and side-effects observed in follow-up and evaluation tools are also discussed, to bring home the various problems which the administrators and policy-planners are interested for future planning of the programme.

About 58 per cent of the wives of the vasectomy acceptors

at these camps were from the age 30-39 years and about half of the vasectomy acceptors belonged to 40-49 years. It was found that at the time of sterilization more than two-fifth acceptors had three or less children. Over three-fourth of all the acceptors were belonging to Hindu religion. About 88 per cent had a monthly income of less than Rs. 100 and majority of them had a very low educational attainment.

One of the important features of the vasectomy camps was the introduction of higher than usual compensation in cash or in some other kind. To the people, the mass vasectomy camps have acted as a catalyst in developing a frame of mind for accepting vasectomy because the prospective case thinks that he would not be the only person.

Motivators drawn from both official and non-official played a very important role in the success of the camps. Majority of complaints related to the trouble of pain and swelling. But they did not have any complaint attributable to vasectomy. A slightly more than half of the cases, rejected for vasectomy, were found medically unfit and remaining slightly less than half were rejected because they were quite old and widowers and unmarried. Those who were rejected on medical grounds were suffering from hydrocele, scabies, ringworm, hernia, and anaemia and other skin diseases. Factors like advance planning, efficient organisation and management, education and motivation, higher incentives, mass publicity and role of top officials played the major role for the success of the Mass Vasectomy Camps.

17. Lloyd, E. Chambliss and Satyanarayana, Y.: An application of probit analysis to a family planning problem: Are cash incentives effective in a sterilization programme? Economic Affairs division staff paper, US Agency for International Development, New Delhi, India, February 1972, 23 p.

The present paper attempts an evaluation using a multivariate technique called probit analysis, in which the effects of many variables can be accounted for at one. This has enabled to estimate what effect various factors combined, including the incentive, have on the acceptance of sterilization, or on the percentage of acceptance in various subgroups of employees. A model was formulated to explain acceptance rates for the Tata and control groups in each zone was tested for the significance of this probit model in each group. Effectiveness of the incentive was also tested.

In its analysis, five variables to be most important in affecting the acceptance of sterilization viz. education level, age,

income, number of sons, and number of daughters were considered in addition to experimental and control groups based on incentive and no incentive for sterilization. Certain variables like exposure to family planning propaganda and availability of contraceptives were not included. The hypothesis that probability of acceptance of sterilization is equal to or less than in East Tata group than in the East Control was rejected at 99.5 per cent level of significance. That is, it was concluded that the incentive was effective in the East. Moreover, it was not possible to reject such an hypothesis for the West, that is, the incentive did not appear to be effective in the West. Estimates indicated that increasing education means increasing acceptance of sterilization and higher income means less acceptance of sterilization.

18. Mehta, P. L.: Work study report on Western Railway Hospital, Pratapnagar, 14 p.

The present study is intended to determine the areas of bottlenecks, delay in efficiency or deficiency in the outpatient department and quick turnover of patients in the wards.

Health Inspectors were posted at different places in the outpatient and inpatient units and were asked to record the timings meticulously in a proforma developed for the purpose. Data pertaining to arrival pattern of patients at different counters, time taken by indoor patients from admission to discharge and observations regarding time taken for investigations and operations etc. were collected and analysed.

The study has developed a new procedure for issue of OPD tickets and registration which when introduced showed marked improvement in the services. By providing certain minimal additional facilities in the injection room and in the dressing room, the time taken by patients in these places, has been markedly cutdown. By improvement in the method of dispensing, i. e. , making ready-made packets, the disposal of patients at the dispensary has also been significantly improved. Through this study it had been possible to understand the processes more scientifically and to bring about improvements in the services of various section of the OPD and wards.

19. Mukerji, K. L.: Administration and organisational aspect of school health services provided through a municipality. Thesis for Doctors of Medicine in Community Health, University of Delhi, 1971, 68 p.

This study examined the administrative and organisational set

up of the school health services provided by the Municipal Corporation of Delhi, and the health care services provided in the schools in terms of staffing, materials, money and other facilities.

The data on various aspects of this service such as organisational structure, functions, services, workload, physical facilities, the extent of co-ordination and supervision under the School Medical Scheme of Municipal Corporation of Delhi, was collected through three methods viz. records, observation and interviews. The data were then suitably processed.

The School Medical Scheme is found to be a useful service for the school children who constitute about 30 per cent of the total population and who are highly susceptible to the various types of preventable diseases. There does not appear to be proper co-ordination among various providers who render services at different levels. Technical supervision is found to be lacking at various levels. Distribution of workload among the School Medical Officers and that of Public Health Nurses is not uniform. While the student population is increasing, staffing pattern is found to remain constant; thereby increasing the workload for each worker. Specialists services were found to be effective. There are no specified functions for various workers under the School Medical Scheme. In specialised clinics, high percentage of patients belonged to the medical speciality followed by Dental, Eye and ENT. While 85 to 90 per cent of the total budget goes for Establishment, a minimum amount is kept aside for "Miscellaneous and Medicine", which constitute about less than 10 per cent of the total budget of the School Medical Scheme. The effective working hours of the School Medical Scheme at school clinics were found to be very meagre, that is about 3 hours per working day and 210 days in the span of one year.

20. Mukerji, V.: Application of some simple multiregional growth and migration models to district levels census data in Maharashtra, Artha Vijnana, 1964, 6(3), 187-205.

A simple population growth and migration model has been applied to census data on population size of the districts in Maharashtra, to investigate the direction of non-migration from the districts. An attempt has been made to study the results thus obtained in relation to the district level information on some socio-economic variable. The model has also been used to work out the district level and compared with the district level and State level population projections for 1971 and these are compared with the district level and State level population projections for 1971 based on district level decennial percentage increase in population during the decade 1951-1961.

21. National Institute of Family Planning: Study of Family Planning Programme of Bihar State. 120 p. (Mimeographed).

The acceptance of family planning programme in Bihar State was extremely low compared to other States in the country. An exploratory study, therefore, was carried out to find out the reasons for the low performance in Bihar State as a whole and factors influencing differential performance amongst the districts of that State. The main investigations were carried out in the two selected districts viz. Ranchi (high performance), Champaran (low performance).

The case study approach was adopted to get the information in depth from various sources like family planning workers, workers of other departments, local leaders and others by interviewing them individually and through collective meetings at various levels viz. State, district and block. There was lack of infrastructure for health and family planning especially at the block and subcentre levels which indicates lukewarm attitude of the Government towards such an urgent and high priority programme. It was suggested that Government should immediately sanction full complement of staff especially auxiliary nurse midwives and lady health visitors. There was lack of integration at all levels of district medical and health services and immediate attention was necessary to the organisational side. Complete co-ordination was required for all working agencies in the State. It has been seen that supervision and guidance from the State and district levels has been generally poor. The family planning programme was poorly developed in the State because of lack of availability of vehicles, equipment and trained and experienced personnel. It was seen that no follow-up system had been evolved to keep in touch with either the sterilization cases or the other adopters of the family planning methods. The expenditure on family planning in Bihar has been the lowest as compared to some of the high performance States. It was found that adequate infrastructure, services, education and motivational machinery were provided so as to gear up entire family planning programme and to improve the output.

22. National Institute of Family Planning: Factors of different family planning performance among selected districts of Uttar Pradesh. National Institute of Family Planning, New Delhi, 65 p.

This study deals with the wide variation existing in the family planning performance in the districts of Uttar Pradesh and attempts to find out differentials in characteristics which make for high and low performance.

Three high performance districts and three low performance districts were studied, selected on the basis of their performance for three years (1967-70) in two methods of contraception, viz. sterilization and IUD. The information on variations in programme organisation, management and workers' motivation are collected through observation of records and by interviewing officials, non-officials, field workers, family planning acceptors, etc. The variation in the performance on this account between the two sets of districts was found to be more than three-fold. Socio-demographic characteristics included proportion of urban population, literacy, occupational pattern, socio-cultural level of population and communication facilities. It was found that the high performance districts on an average had 62.1 per cent of the required staff in position as against only 36.0 per cent in case of the low performance districts. In general, high performance lent heavily upon the use of authority, power and negative sanctions. During the period of the study, technical leadership was found to be lacking. In both sets, there was little evidence of the involvement of the people and their leaders in the programme. The high performance and the low performance districts differed in the way the supervision was organised. There were two outstanding features of family planning programme in Uttar Pradesh. One was the importance of drive periods during which activities were carried out intensively. The other was the involvement of agencies and workers largely depended upon how far the district magistrate was motivated. Work on communication and extension education was found to be inadequate in all the districts with the exception in one. The separation of health and medical as two independent organisations created problems in the smooth working of family planning programme. Lack of medicines and instruments were common complaints. Some suggestions have been made for the role of revenue and planning agencies, drives personnel management, role of family planning workers, district planning committees, technical training of doctors, strengthening of supervisory levels, follow-up services, appointment of specialists, role of voluntary agencies, communications regarding vasectomy.

23. National Institute of Health Administration and Education, Study of District Health Administration, Rohtak Report on Phase I NIHA Res. Report No. 7, 1973.

The objectives of the study were: (i) to make a comprehensive study of health services at the district level, (ii) to assure most effective and efficient use of resources, (iii) to assure integration of preventive and medical care activities, (iv) to assist in orientation of the above mentioned personnel vis-a-vis (ii) and (iii) above, and (v) to evolve a methodology for research in the organisation of health

services at the district level which could be applied throughout India by the relevant authorities.

This Report deals with the diagnostic studies carried out in Rohtak district health administration. For the purpose of the study a samples of Primary Health Centres, Civil Hospitals, Government Ayurvedic Dispensaries, Rural dispensaries etc. were chosen. To understand the structure, functions, programmes and the management aspects of the administration, key, persons like the Chief Medical Officer and other officers at the district headquarters and lower levels were interviewed and observed on the job to ascertain in what manner the incumbents of different posts were oriented to their respective jobs.

The organisation of the district health services although designed for integration, yet the programmes are found to be still running separate. Planning of the programmes is finalised at the State level leaving very little scope for local planning at the district level. Direction and communication for job orientation of almost every category of staff are lacking. There is no evidence of adequate orientation or periodical in-service training. Supervision at different levels is superficial and scanty. Maintenance of records is poor due to improper designing of some of the records or inadequate understanding thereof by the workers.

Observations on the working of the district officers revealed that nearly 50 per cent of their time is spent on various activities concerning their job, about 20 per cent on travel and nearly 30 per cent of the time is spent otherwise. Similar results were found about other categories of staff. At the same time the staff are found not to be fully aware of their duties. Periodical reports are serving only the purpose of making consolidated totals and transmitting to the directorate. Evaluation or feedback are totally absent.

24. National Institute of Health Administration and Education: Study of District Health Administration, Rohtak on phase II.

25. National Institute of Nutrition, Hyderabad: Study of the impact of the programme on the health of children of Chenchu tribe, 1972.

This is a comparative study of supplemented and non-supplemented children conducted by National Institute of Nutrition, Hyderabad. Its important findings: (a) children in the supplemented group maintained better standards than that of the children of non-supplemented group according to anthropometric measurement, (b) incidence of signs of protein calorie malnutrition is also considerably low, (c) acceptability of the programme among the Chenchu community

is quite satisfactory, and (d) the study indicated ample scope for expansion of the programme through locally available inexpensive food.

- ✓ 26. Pruthi, P. S. and Surinder, J. J.: Group of Hospitals: An organisational study. Project report, June 1973, 126 p.

The scope of the present study was to review the working of the J. J. Hospital with a view to identifying the existing gaps and to formulate a plan of action for improving the operational efficiency of the hospital through the application of modern management techniques and practices.

✓ The approach consisted of dividing the organisational aspects of the J. J. Hospital in seven broad areas as organisation and administration, financial administration, purchase and storage of drugs, in patient care, out patient care and infra-structural services and future growth. Accordingly these seven areas were taken up one by one and the conclusions and recommendations listed.

✓ Among the major problem areas of the administration were found to be lack of involvement and effective leadership at the higher levels; lack of discipline at lower levels; low morale and motivation all along the time; widespread indifference to the basic objectives of the institution, namely, patient care, medical education and research; absence of the application of modern management practices in almost all major areas purchase distribution and stock-keeping; and inefficient use of the limited resources of money, men and materials. The prevailing practices in all the areas under study were archaic and unsatisfactory and, therefore, needed short run and a long run strategy to rectify the existing gaps were suggested.

- ✓ 27. Ramaiah, T. J., Mehta, S. R. and Timmappaya, A. : Report of the Study of Emergency and Casualty Department in Irwin Hospital, NIHAE Res. Rep. 8, 1971, 38 p.

The objectives of the study were to investigate the functioning of the Emergency services Department in terms of the existing policies and procedures, layout, workload, staffing pattern and physical facilities, to identify the areas needing improvement or better utilization and ultimately suggest changes to solve these problems without involving any substantial additional expenditure.

✓ The methodology adopted in this study for the purpose of collection of data consisted of (i) retrospective study based on records, (ii) prospective studies for understanding of work situation

using work study techniques, and (iii) interview with various categories of workers to elicit information pertaining to the problems in their day-to-day working etc. The study found two types of problems - rampant in the working of the central casualty and Emergency department namely those pertaining to organisation and administration of service within the department and those pertaining to inter-departmental co-ordination. From the present set up of the casualty and Emergency Department, its proper functioning demands full co-ordination between this department and other departments such as stores, transport, medicine, surgery but no such understanding exists at the present moment thereby affecting the quality of work. A number of measures to improve the existing situation without incurring additional expenditure were suggested with regard to each of these two areas.

28. Ramaiah, T. J., Kataria, M., and Timmappaya, A. : Systems Analysis of hospital bed utilization (Mimeographed), 1974, 240 p.

This study was undertaken during 1972-74 with the financial assistance from the Indian Council of Medical Research. It comprised of mainly two components, namely, one a retrospective study of 23 hospitals in the States of Punjab, Haryana, Uttar Pradesh, Madhya Pradesh and Rajasthan with the objectives of comparing and contrasting the utilisation patterns within a hospital and between hospitals during the 1966 to 1971 and identifying major causes of variations apparent from the utilisation indices including hospitals policies and procedures, if any. These 23 hospitals selected were large non-teaching general hospitals with the bed capacity more than 150. The second component, a prospective study, was carried out in four hospitals selected from amongst these 23 hospitals with the objectives of identifying the determinants of length of stay, determining components of length of stay in terms of time sequences of events, identifying components that could be eliminated without at the same time affecting the quality of care and helping to develop policies and procedures which would economise the resources of the hospital and improve utilisation of hospital beds.

For the retrospective study, data on hospital characteristics and utilization indices were collected from the registers and records available therein. In addition, interviews of medical officers and relevant departmental heads were carried out through an open ended questionnaire. The prospective study was far more detailed and was carried out for a period of 20 days in each of the hospitals. During this period, each patient admitted to the hospital was studied day after day and the data on patient profile, treatment profile and result was collected from the study of case-sheets of

the patient, registers and discussion with the attending physician, ward sister and the patient relatives. Further, the status of the patient's condition was established using the criteria of the progressive patient care. The data thus collected was subjected to statistical analysis such as step-wise multiple regression analysis, analysis of variance, time-series analysis etc. using some of the library programmes available with the computing centre of the University of Delhi and run on IBM - 360 available with them.

Though the hospitals are highly comparable with each other, they considerably differ from each others in the utilisation of their bed resources. Most of the hospitals do not have any policies and procedures with respect to the admission and discharge of patients. In addition, the length of stay of patient is found to be influenced by many variables some of which could easily be controlled by the hospital administration such as the number and point in time when the investigations should be asked for. When the patient should actually be admitted etc. it was found that a minimum of about 15.3 per cent and a maximum of about 21.4 per cent of the patient days could be safely reduced without touching upon the quality of care which however, varies from hospital to hospital.

29. Rele, M.R. and Timmappaya, A.: Report of the study of utilization of Operation Theatres in a general hospital. NIHAE Research Report 9, 1972, 52 p.

This study has been carried out in Operation Theatres (OT) of one of the hospitals in Delhi in respect of the physical facilities, staffing pattern, workload, scheduling of OT time to surgeons and scheduling of patient, for surgical procedures, time utilization of available facilities and reactions of personnel working there about the present set up. The study concentrated only upon 14 out of 29 Operation Theatres in the main Operation block of the hospital.

Discussions were held with the concerned staff to elicit the policies and procedures for the operation of OT facilities. Data was collected through retrospective study of the registers and records of operation theatres to assess the actual services rendered and number of operations cancelled daily. Actual study of work-situation was assessed by observation and interview. It was observed that patients had to wait in pre-operative room on an average of 2 hours varying between 20 minutes to 4 hours. Failure of equipments, carelessness of class IV employees, improper preparation of patients were the main reasons for making surgeons irritated. It was found that 28 operations on average were being performed daily. The average idle time of OT per day was approximately 55 per cent of the working time and 16 per cent of scheduled operations were being cancelled due to the shortage of

blood or failure of equipment, etc., causing an idle time of 5 per cent. The existing staffing pattern was found to be more than adequate to meet the workload. The study has brought out many more problems which need attention such as the state of morale of class III and IV employees, poor allocation of operation theatres, lack of inter-relationship and team work.

30. Satyanarayana, P.: A study of the intensive care unit at AIIMS Hospital, New Delhi. MHA Thesis, AIIMS, New Delhi, 1972, 114 p.

The objectives of the study are two-fold: (i) to study the intensive care unit at Medical Institute Hospital and to analyse critically its functioning in so far as the number of patients and nature of disease treated, and problems of ICU with reference to its location, size, physical facilities, staffing, nursing and medical and administration, and (ii) to suggest some such criteria which by governing the admissions judiciously, will ensure, the right patient, in the right bed at the right time.

The methodology adopted for the study consisted of conducting on the spot study, collecting information on a total of 400 cases treated in intensive care unit. The facilities of intensive care unit were critically examined to unearth the shortfalls and problems encountered in rendering intensive care to the patients. The nursing staff was interviewed on the problems they face and a questionnaire was circulated among the nursing staff covering all the facets of the intensive nursing care. A selected set of patients were chosen and their opinion about the standard of care in intensive unit when compared to the traditional hospital care.

The study concludes that sixteen intensive care beds are adequate to the needs of surgical discipline of the hospital. The deficits in physical facilities of the unit can be to a large extent, met by reorganising the layout to attain maximum sepsis control and minimise cross infection. The shortfalls in equipment are of simpler order. The suggestion for better availability of simple equipment in the built-in form involve little financial implication. There is shortage of nurses resulting in overwork and quicker turnover measures like a better nurse patient ratio, proper training programmes, reduction of non-nursing duties and incentives for good workers etc.; have been recommended to ensure better patient care. Formation of an intensive care unit committee is felt to be the dire need to coordinate and reconcile conflicting demands.

31. Sharma, S.C.: A study of accident and emergency services (Casualty Department) in some of the hospitals in Delhi. MHA Thesis, AIIMS, New Delhi, 1968, 89 p.

The study aims at ascertaining the actual state of affairs in respect of some aspects of the casualty department of some of the hospitals of Delhi with a view to finding out the degree of efficiency of these departments and their adequacy. The study covered the following aspects functions, organisation, personnel, general policies, procedures, standing orders, records and co-ordination and communication amongst the hospitals under study.

32. Singh, S.N.: A probability model for couple fertility. Sankhya, 1964, Series B, 26 (1-2), 89-94.

It has been observed that during a given time T. some couples have no conception, some have one while others have two or more. Our purpose is to find a probability distribution which describes this variation. The paper derives a probability distribution under certain assumptions, gives a procedure for estimating the parameters and their variances, and applies the distribution to two examples.

✓ 33. Srivastava, A.B.L. and Bali, R.S.: Utilisation of the laboratory services in the Willingdon Hospital. Mimeograph, 1974, 60 p.

The main aim of the study was to find out how the existing service facilities of the laboratories of the Willingdon Hospital were being utilised and what problems were being faced in view of the growing demand for these services. Retrospective data for the last few years was analysed, and also patients, laboratory technicians and the pathologists were interviewed in order to get an idea of the problems faced by them. Also work sampling method was used for studying the time utilisation of the technicians. It was found that while workload has increased to about thrice (from 150,000 tests in 1963 to 475,000 tests in 1973) during the last ten years, there has been almost no increase in the laboratory staff during this period.

✓ In the pathology laboratory, 83 tests were performed per 100 (new) outpatients and 634 tests of per 100 inpatients in 1973. ✓ During the study period of one week, on the average 357 blood tests, 84 urine tests and 25 stool tests were performed daily in this laboratory. In the bio-chemistry laboratory, the average daily number of blood tests was 143 and of urine tests 27. ✓

From a week's observation, it was found that about 22 per cent of the requisitions for test came after the scheduled time, out of which 27 per cent were accepted by the technicians at their discretion, and the remaining patients were required to come on the following day.

✓ In the pathology laboratory, the average waiting time was 37 minutes for the patients to give blood samples, and on certain days of

the week it was as high as 49 minutes. In spite of the heavy workload, in the pathology laboratory, the technicians spent about 45 per cent of their time in productive work, 40 per cent in non-productive work and 15 per cent of their time was idle. Some of the tests, such as TLC, BT and CT for blood were not being performed very methodically.

The main problems brought out by the study were lack of properly qualified technicians, poor equipment, inadequate staff, shortage of space and certain organisational shortcomings. The procedures of requisitioning for tests and collection of specimens, and reporting of test results required streamlining. Centralisation of the laboratories and change in working hours, were also needed for the convenience of patients and improvement of efficiency.

34. Srivastava, A. B. L. and Bhandari, S. C.: Utilisation and pattern of demand for the CGHS Ayurvedic Dispensaries in Delhi. Mimeograph, 1974, 80 p.

The main objectives of the study were to assess the demand for Ayurvedic treatment facilities under the CGHS in Delhi and to investigate the pattern and rate of utilisation of the existing facilities. Out of the five Ayurvedic dispensaries in Delhi, the one at Kidwai Nagar was picked up for the study. Data were collected on patient volume from past records, and on utilisation of the physicians' and pharmacists' time, satisfaction from treatment, etc. from observation and interview of patients and physicians. Some comparable data was also obtained from the CGHS allopathic dispensary of the same area.

In the Ayurvedic dispensary the average daily attendance steadily increased from 210 in 1970 to 291 in 1973 but in the allopathic dispensary it decreased from 565 to 492 over the same period. The average number of visits per episode of illness was more in the Ayurvedic dispensary (3.7) than in the allopathic dispensary (3.0), which shows that relatively more of the chronic cases are drawn to the former.

The average time spent with a patient by the physician was more or less same in the two dispensaries (about 3 minutes), but the Ayurvedic pharmacist required 1.64 minutes to service a patient compared to 1.02 minutes required by the allopathic pharmacist. The average waiting time per patient was found to be about 5 minutes in the morning and 15 minutes in the evening in the Ayurvedic dispensary on the days selected for observation.

In all 494 patients from the Ayurvedic dispensary and 183

from the allopathic dispensary were interviewed. About 93 per cent of the new patients and 68 per cent of the old ones were satisfied with the treatment in the Ayurvedic dispensary. Satisfaction about dispensary arrangements and availability of medicines was somewhat less in the Ayurvedic dispensary compared to the allopathic one.

Over 70 per cent of the patients in the Ayurvedic dispensary were those who came because of the belief in the system, because of not getting any relief with allopathic treatment.

The present dispensary caters to the area served by 17 CGHS allopathic dispensaries. The most common reasons given by the patients for not utilising the dispensary facilities as frequently as they would have liked to were long waiting time and long distance between the dispensary and their homes. Keeping in view the rate of utilisation of the dispensary by the patients from the Kidwainagar area itself, it was estimated that one Ayurvedic dispensary with three physicians should cater to an area covered by just four to five allopathic dispensaries and not more.

35. Takulia, Harbans S. Taylor, Carl E. Sangal, Brakash, S. and Alter Joseph, P. Health Centre doctor in India, Maryland (USA): John Hopkins Press, 1968.

In this volume the current working situation of the doctor in rural health centre is described, as viewed by the doctors themselves and by five other professional groups involved in determining health centre and medical education policy. Out of the analysis of present conditions, recommendations have been made for improvements in health centre administration.

36. Tara Gopal Das: Project Poshak - An integrated health/nutrition micro pilot study for rural pre-school children, 1974.

A multiphased, operation oriented project was conducted in Madhya Pradesh and was designed to list out the feasibility of the take home delivery approach for providing rural pre-school children and nursing mothers.

This was started in August 1971 and was completed in four phases. Madhya Pradesh being backward and having highest tribal population was selected for pilot study. Both pre-cooked sweetened and favoured food supplements PKEM and instant CSM were supplied by UNICEF from CARE donated supplies and were distributed weekly. Nutrition and child care education were provided through pamphlets and charts. Health services were provided by

the project doctors fortnightly at village clinics and other days by the centre doctor.

Food collection was relatively better among tribal, nuclear families, those with male child beneficiaries, non-working mothers and others. Education exposure was higher among non-working mothers, non-tribal mothers, higher income families and others.

Medical services were better utilized for male child beneficiaries, younger children, more literate and higher income, etc.

Weights and heights increased insignificantly between control and non-control groups. Experimental group mothers achieved significantly higher scores in child care education compared to control group. Mothers were more inclined to participate if their children were also enrolled.

With an indigenous food, an integrated package of services is estimated to cost per child per annum - food - Rs. 90, medical services - Rs. 15, child care education - Rs. 2. 40 and implementing personnel cost Rs. 96 (Total Rs. 203. 40) a year per beneficiary.

37. Timmappaya, A. and Ramaiah, T. J.: Utilization of services in four general hospitals in Delhi. A preliminary study, NIHAE Bulletin, Vol. II, No. 3, 1969.

This paper presents the results of a study of utilization patterns of hospital beds in eight specialities of four Delhi hospitals. Information for this purpose was collected on the total bed complement, the allocation of beds to different specialities, average length of stay of patients, and bed occupancy and bed turn-over rates for the year 1967.

While the average length of stay of patients in three hospitals was ranging between 7-10 days, in the fourth it was 19. 4 days. Similar variations were present speciality-wise also. Bed occupancy rates varies between 85. 5 per cent and 117. 6 per cent. While in some specialities of a hospital, the occupancy rates were for more than 100 per cent in some others of the same hospital it was less than 60 per cent. The data presented clear cut seasonal variations in occupancy rates and average length of stay of patients.

38. Tewari, T. R., Sharma, M. I. D., Dutt, P. R. and Makhija, H. R.: An Exploratory Study of Integrated Health Services in India. NIHAE Research Report 4, 1971, 238 p.

The present study, the first of its kind in India is of an

exploratory nature. It was taken up to determine the origin, broad dimensions and results of the process of integration, and to plan a series of projects for subsequent studies in depth.

The study aims at (i) studying the background factors with a view to elucidate the operating processes, (ii) studying of differential perception of the phenomenon of integration, (iii) studying of the extent to which integration has progressed in different States, and (iv) studying of the impact of integration.

Certain assumptions were spelt out for carrying out the study. The methodology used in the study included interviews with the respondents based on a questionnaires, records and reports and observations. States were selected on the basis of preliminary observations on the organisational structure particularly at the District level and the number of cadres etc. Eight States selected were Punjab, West Bengal, Gujarat, Maharashtra, Andhra Pradesh, Rajasthan, Uttar Pradesh and Mysore for exploratory study; and Andhra Pradesh, Uttar Pradesh, Rajasthan and Mysore for depth studies.

The study observes that there is a refreshing unanimity through the State, district and Block levels about the basic concept of an Integrated Health Service. The study spells out a few attributes encompassed by the above concept. The study observes an undue and excessive reliance on administrative orders and instructions, which were at best neither exhaustive nor informative enough, to generate the required change of outlook and approach on the part of those expected to implement on Integrated Health Service. The study has listed other findings some of which expose the inconsistencies and anomalies in the present set of health services.

39. Uthaya, P.K.: A study of ward administration in a General Surgical Ward of some of the hospitals in Delhi. MHA Thesis, AIIMS, New Delhi, 1968, 140 p.

The study deals with ward management in the hospitals AIIMS, Safdarjang and Willingdon with particular reference to the layout of the ward, equipment and supplies, staffing pattern, communication, records, ward hygiene, allied services, teaching and fire precaution.

Data were collected from records, through interview and observation from the three hospitals with respect to each of these areas. The study observes that for good ward management specially of a general surgical ward, they should basically be planned to avoid cross infection, and the layout and facilities should meet certain requirements. Centralisation of all equipment and a well organized maintenance department are very important. Team approach has

been emphasised with incentives such as certificate and prizes for the best team. Communication between the employees as well as with patients need improvement. The number of records presently maintained by the ward staff were found to be too many. A separate house keeping department with sufficient number of supervisors, and centralisation of washing of soiled linen and garbage collection need to be established for improving the ward hygiene. Public relations were to be improved by having well informed and well oriented staff and by improving patient care. The education of patient as to how to look after himself and prevent further illness was emphasised. ✓

The difficulties and handicaps experienced by the inpatients were studied and suggestions for amelioration, or improvement of the conditions, and to the extent the improvements can be carried out, were discussed.

B. COST ANALYSIS OF HEALTH SERVICES SYSTEMS AND SUB-SYSTEMS

1. Indian Statistical Institute: Work study and costing for central sterilising room Safdarjang Hospital, New Delhi.

Indian Statistical Institute, Statistical Quality Control Unit,
New Delhi, February 1969.

The Central sterilising service department is responsible for washing and sterilising of needles, syringes, trays, etc. for the different wards and departments of the hospital and for a number of Government dispensaries.

The objectives of the study were to (i) determine standard cost of sterilisation of different items, (ii) establish standard times for different activities, (iii) improve the present methods of working wherever possible, and (iv) reallocate manpower against the workload.

Work measurement was carried out for the different operations like needle processing, syringe washing, washing of trays, etc. to find out the standard time for different operations. Each cycle of Operation was divided into small elements of work and data on time taken to perform each element of work was observed. The different stages of an operation were examined initially for the following points: (i) whether the stage was required at all, (ii) if required, whether the time taken would be reduced by using different equipment or different methods, and (iii) whether there was duplication of work, if so how it can be eliminated by rearranging the different operations.

The conclusions of the study can be summarised as follows. It was found that strength of personnel requirement was 27 as against 37. The allocation of these 27 personnel in the different sections was worked out. Alternative methods by which needles would be first checked for bluntness and then for blockage, for washing of syringes, packing of trays and other items were suggested. The study also gave unit costs of different services in CSS.

2. Indian Statistical Institute: Work study and costing in laundry at Safdarjung Hospital, New Delhi. Indian Statistical Institute, Statistical Quality Control Unit, New Delhi, March 1969, 10 p.

The objectives of the study were to establish standard times for different activities in the laundry, to estimate manpower requirement against the present workload and lastly to determine the standard cost of washing unit of linen.

Each cycle of operation was divided into small elements of work. The actual time taken to perform each element of work was observed for a cycle. Ten observations were taken for each element of work in a cycle. The observed timings were given percentage rating at the time of observation work. The present workload was computed from the past three months' records. The total number of items was divided into eight groups of items depending upon their sizes as the washing machine, folding and drying. The manpower required for running the laundry in each shift was then calculated on the basis of workload on the operation for the machine section. Similarly the manpower required for folding, drying, ironing and calendering were calculated and concluded that the required staff should be 29 in strength. Cost analysis was then carried out by splitting the cost of running the laundry into variable costs and the fixed costs. Having known the costs, incurred by way of wages to staff, material cost, maintenance, depreciation and overhead costs, the cost of washing per 100 assorted pieces was found out.

It was found that the capacity of the machines as given by the manufacturer was an over-estimate and if the capacity was to be fully utilized the quality of washing would be poor. The quality of work was satisfactory upto 75 per cent of loading of 100 lb washing machine and 80 per cent loading for 200 lb machine and suggested that these norms be strictly followed. It was suggested that when the average workload reach 4,036 pieces per day, another 200 lb washing machine should be installed so as to tackle to all wards and departments. A mechanic should be made available to the laundry for breakdown maintenance service. The six orderlies loaned to the laundry were recommended to be regularised.

3. Indian Statistical Institute: Costing in food services department at Safdarjang Hospital, New Delhi. Indian Statistical Institute, Statistical Quality Control Unit, New Delhi, June 1969, 50 p.

The aim of the study was to find out cost per diet separately for adults and children in Safdarjang Hospital, New Delhi.

Data was collected for all cost centres separating out variable costs from fixed costs. One of the major variable costs

was found to be direct material which was separated out from other cost heads. Food services department has been preparing five types of diets for adults and seven types of diets for children depending upon the patients requirements. Altogether 444,533 diets were prepared during previous year, against a total expenditure of Rs. 959,034. 17. Cost for different types of diets separately for adults and children has been estimated. The average cost per daily diet for an indoor patient was found to be Rs. 2. 19. The average cost of daily diet varied from Rs. 1. 40 to Rs. 2. 60 for adults and it varied from Rs. 1. 35 to Rs. 2. 13 for children. It was recommended that the cost estimates as found in this study should be periodically reviewed to adjust any change in the cost elements specially of variable type. So that the same can be used as an instrument for administrative action.

4. Indian Statistical Institute, Costing in X-Ray Department at Safdarjang Hospital, New Delhi. Indian Statistical Institute, Statistical Quality Control Unit, New Delhi, May 1971, 4 p.

The main objective of the study was to estimate cost per a good X-Ray exposure. Total cost for running the X-ray department was divided under two broad categories fixed cost and variable cost. Wages to staff covered expenditure on Direct labour, Supervision and Administration. The total wages paid to the staff in a year were Rs. 207,408. 40. For facilities like Provident Fund, Pension, Medical Assistance, etc. 20 per cent of total wages were added to the overhead. Material cost involved the expenditure on material used for X-Ray such as films. Total expenditure on films per year was of the order of Rs. 451,169. 20. Total estimated expenditure for electricity, power and water per year was Rs. 2,466. 50. Ten per cent of the cost of X-Ray machines and other equipments including cost of installation was taken as depreciation per year. Average number of exposures taken daily was worked out from X-ray department records and it was of the order of 400 exposures per day. It has been seen from previous records that on average about 5 per cent of films were destroyed due to various reasons. Total annual cost for running the X-ray department was found to be Rs. 823,341. 00. The cost per good exposure has been estimated as Rs. 7. 29.

It was observed that about 1 per cent of the X-ray films get wasted because of wrong entry at the registration counter and two per cent of them get wasted due to fault in machines. If the required size of the films were not available, it was observed that next higher size films were used which cost more. It has been suggested to conduct periodic review of cost elements to adjust any variation in cost occurring over a certain period.

5. Kataria, M., Timmappaya, A. and Juyal, R. K : Report on cost

analysis of nursing home of Willingdon Hospital. NIHAE
Research Report 16/73, 28 p.

Cost analysis of the Nursing Home of Willingdon Hospital was carried out for the year 1971-72 for helping the hospital administrator for providing him information on, how the expenditure was being incurred on various services and to give him an idea of the costs of per unit output.

The methodology for the cost analysis developed through a pilot study conducted by NIHAE in two district hospitals in Haryana was extended to the present study with suitable modifications. By thorough scrutiny of records and registers and interviewing of concerned officials, the data on the expenditure and output of the financial year 1971-72 was collected for the various departments like X-ray, laboratories, blood bank, laundry, diet, etc. taking into consideration staff salaries, medicines, chemicals, equipments and instruments, electricity, water, linen, telephone, etc. Keeping in view the organisational set up of the nursing home and the availability of the data, certain assumptions were also made for calculating and apportioning the various costs.

It was observed that the total expenditure for Nursing Home during 1971-72 was approximately Rs. 13,94,007 which excluded the expenditure on transport and depreciation cost of building and equipments. Out of this total expenditure, the maximum was for staff salaries Rs. 3,65,011 (26.2 per cent) while the next maximum was for drugs, medicine, surgical dressing and gas Rs. 3,44,636 (24.97 per cent). A good proportion of the expenditure was for X-ray department (10.7 per cent) and for diet department (11.2 per cent). The ratio of cost of in-patient day to the out-patient visit was observed to be 6:1. The study presented unit costs of different services.

6. National Institute of Health Administration and Education - A Study of Central Government Health Scheme Dispensaries in Delhi, Feb., 1973, p. 20 (Mimeographed).

Eight CGHS dispensaries selected on the basis of stratified two stage systematic sampling design with proportionate allocation were selected so as to help delineate the trends in the utilisation of services and costs by various categories of staff, namely, class I, II, III and IV. About 13 per cent of the families in eight selected dispensaries were studied. Data were collected through records, actual observations and interviews. The conclusions emanated from the Study are: higher percentage of beneficiaries from the dispensaries predominantly catering to lower class beneficiaries utilised the services in comparison to upper class dispensaries; average

number of visits per family was about five which remained the same in all categories; while there is one visit to specialist for every two visits to GDMO on an average amongst MPs, the same is found to be eight visits to GDMO for every visit to specialist amongst class IV category of beneficiaries thereby showing higher utilisation of specialists services by upper classes, the number of restricted medicines prescribed per general medicine was found to be increasing with the rise in the status and class of beneficiaries.

While three general medicines are prescribed per restricted medicines amongst MPs, ten general medicines are prescribed for every single restricted medicine amongst class IV category, thereby showing towards the higher utilization of restricted medicines by the upper classes; average cost of medicines per family was 2.8 rupees amongst class IV which found increase with rise in the class and status of beneficiaries; average cost of medicines per visit to GDMO, to specialist and per illness also showed decreasing trends with decrease in the class of beneficiaries.

7. Indian Institute of Public Opinion. The Nations Health and the Drug Industry. Blue supplement to the monthly commentary on Indian Economic conditions by the Indian Institute of Public Opinion, Vol. XV, No. 3, 1973, 7 p.

The paper discusses: (i) drugs in the Health Care Revolution, (ii) cost of drugs and problems of expansion, and (iii) the structure of hospital expenditure under inflation. A survey was carried out in a sample of hospitals of five cities - Delhi, Madras, Lucknow, Chandigarh and Jaipur with reference to the pattern of expenditure on drugs is presented. The study points out that although there had been a massive investment to improve the efficiency of health systems, much of the expectations had not been realised. Mere expansion of hospitals and increased bed capacities is not going to solve the gigantic problem of meeting the health needs of fastly increasing population. Further economies could be effected by good management in the hospitals. The study concludes that the per capita expenditure on drugs in hospitals financed by hospitals works out to only Rs. 2.40 per patient. This is higher in small hospitals (or nursing homes); it is much lower in Madras (Rs. 0.69 only) and significantly lower in Jaipur (Rs. 1.52) but pretty stable elsewhere. Clearly drug costs are marginal per patient; they are not, however, insignificant as a percentage of hospital expenditure although on an average even this is less than a sixth of total expenditure.

8. Narang, C.R.: Study of Central Sterile Supply Department (CSSD) at Delhi Hospital including work study of packing procedure and cost accounting of following items processed by CSSD at All India Institute of Medical Sciences intravenous,

set pack and syringe pack. MHA Thesis, AIIMS, New Delhi, 1967, 162 p.

This is the study of the central sterile supply departments of five hospitals located in Delhi including work study of packing procedures and cost accounting of following items processed by CSSD at AIIMS Hospital: (a) Intravenous (iv) set pack, (b) syringe pack.

A questionnaire was devised for the purpose of obtaining detailed information on organisation, scope of services, physical facilities, equipment and methods of operation. Detailed discussions were held with the hospital administrators, officers-in-charge and supervisors of CSSDs. The personnel working in the CSSDs were also interviewed regarding problems and the methods of working. The information thus gathered was then analysed and the conclusions drawn. The study presented units of time required for performing different activities. Number of suggestions for improving the CSSD services were made. On the basis of its cost accounting the study has estimated the cost per unit of reusable materials, cost of detergents, gauge, laundry, sterilizing etc.

9. Samuel, T.J.: The cost of children in India. In 2 parts. AICC Economic Review. 1953, 15(10), 19-22 and 1964, 25(20), 31-32.

Consideration of the question "How much does it cost to the patients, to the society and to the nation to produce a child, bring him up, educate him and provide him with the amenities of life on a level available to an average citizen." Classification of costs indirect and direct was done. Notes on studies in the United Kingdom and the United States, Comments on Indian costs based largely on data in the Report on an enquiry into the family budgets of middle class employees of Central Government in 1945-46, by the office of the economic advisory to the Government of India were given.

10. Sinha, R. P.: Comparative in-patient costs in Delhi Hospitals. MHA Thesis, AIIMS, New Delhi, 1967, 85 p.

The present study analysed the cost of in-patient care per patient day in two different types of hospitals in New Delhi, namely, an autonomous post graduate teaching and research centre like the AIIMS, and a general hospital managed directly by the Government of India, the Safdarjang Hospital.

A set of parameters to be utilised for cost accounting in Indian Hospitals for in-patient beds has been devised and tested so as to establish a set of comparable parameters for future to

apportion time of personnel in various activities of medical institutions, hospitals including teaching hospitals engaged in research and training.

The study observes that the cost of per patient day at the AIIMS Hospital was Rs. 21.46 and that at Safdarjang was Rs. 15.05. The difference of Rs. 6.41 in the unit costs per patient day at the AIIMS hospital reflects the higher cost on salaries and wages of staff at the AIIMS and the higher cost on drugs, diet, services and electricity.

The study has brought out the necessity of a quick turnover of patients and of keeping the beds fully occupied and fully utilized. It has also been brought out that the cost of in-patient care is showing an upward trend in Indian hospitals probably because of specialised care being gradually introduced in such hospitals. The high cost of service in Delhi hospitals as compared to that in some other developing countries is due to the introduction of modern trends in the inpatient care.

11. Sharma, H.R.: A study of Health Economics cost of Bringing up a child in India. NIHAE Bulletin, Vol. III, No. 2, 1970, p. 90-107.

The concept of investment in human material is discussed certain basic assumptions are spelt out and a method based on component approach to compute the investment in bringing up a child upto the age of 18 years is outlined.

Data based on socio-economic conditions of 1959-60 was analysed. The study reveals that every year 21 million births among the women of India result in loss of earning of Rs. 88.09 per child i. e. Rs. 1,850 crores which is the equivalent of 23.8 lakhs worker years of earning or 1.44 per cent of total National Income. At the modest estimate of an infant mortality rate of 100 per 1000 live births, 21 lakhs of infants die every year which results in a loss of 3.367 lakh worker years of earnings or 0.2 per cent of total National Income. The study points out that the consumption for a child is Rs. 6,749 and per survivor is Rs. 6,968 which are respectively equal to the 8.7 years and 9 years earnings of a worker. These earnings are lost when a child dies before attaining 18th year of age. In terms of percentage, the study reveals that 4.13 per cent of the investment in bringing up children is wasted due to premature death before reaching the age of 18 years.

12. Sharma, H.R. and Timmappaya, A.: A pilot study in Hospital cost Analysis. NIHAE Bulletin, Vol. IV, No. 1, 1971, p. 33-38.

The need for hospital cost analysis, the data routinely available from hospital accounts and records for this purpose are discussed. On the basis of the available data, a method of cost analysis is outlined which can be adopted as a matter of routine by the hospital authorities. Using this method, two non-teaching district hospitals have been subjected to cost analysis and the results of the same are presented.

13. Sundar Rao, P. S. S.: Patterns of health expenditures among rural and urban communities of North Arcot District, Tamil Nadu, India. Research Monograph, Department of Biostatistics, Christian Medical College, Vellore, India, 1973, 79 p.

The objectives of the study were to develop survey methods of assessing health expenditures, qualitatively and quantitatively to obtain estimates of the cost incurred for maintenance of health in communities, residents in urban and rural areas; to obtain estimates of the expenditures incurred as a results of pregnancy including its termination; and to describe the manner of spending money for prevention of disease at different levels and to examine varying patterns if any among different communities.

The study was embarked in 1970 and was completed in 1973. In order to determine the most suitable method, a first year of the research project was spent in developing methods of investigation which included the type of study, format of questionnaires and organisation of the survey procedures and sampling design. On the basis of the results of the pilot studies, data was then collected retrospectively for one year and prospectively for one month using direct interview techniques.

The average health expenditure reported was approximately Rs. 13.00 per person per year and Rs. 80.00 per family. The findings of the study reveal a strong positive relationship between expenditure on health and per capita income. However, in terms of percentage to total income, the proportion spent on medical care was maximum for the lowest income group, being 7 per cent as compared to about 2.5 per cent among those in the highest income bracket.

The analysis by community groups show some striking differences between forward communities and all others. The higher health expenses among forward communities may be due to higher per capita income, higher level of education, better standard of living etc. Personal health expenditure shows a gradual decline as distance from the nearest town increases though the differences barely attain statistical significance. Analysis by reasons indicate high expenditures during the period from July to February. The mean per

capita health expenditure per month was maximum during the rainy seasons (Rs. 1.52), least during the summer (Rs. 0.42) and in between during the winter (Rs. 1.15) significant differences in expenditure were observed between different age groups.

14. ✓ Sengupta, S. K.: Cost of Institutional equipments in India (Mimeograph), 1973.

C. COST-BENEFIT AND COST-EFFECTIVENESS ANALYSIS OF HEALTH SERVICE SYSTEMS

1. Agarwala, S. N. : Evaluating the effectiveness of a family planning programme, Research in Family Planning. (C.V. Kiser, ed.) 409-420 Princeton University Press, 1962. Also Journal of Family Welfare, 1962, 8(4), 8-19.

Evaluation of family programmes and how it is done is dealt with in this paper.

2. Basu, S. and S. Ray. : Impact of Intra-uterine contraceptive devices, Economic and Political Weekly, 1968, 3(23), 879-881.

Shows how the IUCD programmes after an initial spurt showed a drastic decline due to the launching of programme without careful planning or preparatory work. Article based on data from West Bengal villages.

3. Bhatnagar, N.K., Khanna, J. : "Family Planning and Its Impact". Family Planning News, 1962, 3, 248-249.

In this article analysis of the records of a family planning clinic at Lodi Road, Delhi has been made and in view of socio-economic and demographic facts, effectiveness of family planning methods has been examined.

4. Mehta, Ramesh: Review and Analysis of cost-benefit studies. Ministry of Health, Family Planning and Urban Development, October 1971, 11 p.

This paper is designed to explain the methodologies used in computing benefits in family planning, to review and analyse some major items of work done on cost-benefit analysis specially those directly related to India.

The author has summed up the cost-benefit studies conducted by Coale and Hoover in 1958, Stephen Enke in 1960, Robert Cassen in 1968, Robert Repetto in 1968, R. N. Basu in 1968, Zaidan in 1969,

Julian L. Simon in 1969, L. N. Dahia in 1969 and George B. Simmons in 1971. There are some authors who measure benefits of birth prevention in terms of variations in per capita income (Coale and Hoover, Zaidan, Robert Cassen), others in terms of benefits to society at large (Enke, Repetto, Simmons). Other measures of benefits have been effects on national income, per capita consumption etc. The basic economic variables used in the computation of benefits are increments in consumption, investment, savings, labour supply and outputs. The researchers have been really at odds on which discount rate to use to bring the stream of future benefits to the present. Rates used have varied from 0 per cent to 15 per cent with 10 per cent being the most widely accepted one. The benefits computed by each author are valid only for the year for which the economic variables are valid.

The lowest value of an averted birth (at 10 per cent discount rate) has been found to be Rs. 690 (Stephen Enke) and the highest value as Rs. 7,800 (George Simmons). The lowest estimate of benefit-cost ratio was 5:1 (Repetto) for the Madras Vasectomy Programme. These estimates showed that benefits were far greater than costs for the Indian Family Planning Programme. The cost per birth averted for the programme since inception was around Rs. 100. But in recent years, due to increased expenditure and lower performance, these were between Rs. 120-130 per birth averted. Using the stream of birth prevented overtime and valuing each birth prevention at Rs. 2,700, a 10 per cent worth of the benefits was obtained. The worth of the 1970-71 programme was Rs. 6,121 million. The expenditure for 1970-71 was Rs. 382 millions. A conservative benefit-cost ratio for 1970-71 was 16:1. It has been recommended that since benefits were so much more than costs, it was not necessary for the department to spend its time in computing a refund value of the benefits.

5. Mitra, A.: Making hard choices between cost benefit streams of health and nutrition programmes. A paper presented at the twenty-second meeting of Protein Advisory Group of UN systems at Rome on 24-28, June, 1974, 17 p.

The paper reviews costs and benefits of special nutrition programmes in India. Discussion on nutrition has so far centred on adults and around the problem of productivity; and the shift in concern for nutrition for babies and young children, expectant and nursing mothers, is a recent phenomenon. Many researchers in this connection also argued that what is important in the Indian context is a sufficiency of food rather than of proteins not only for growth and development of the body but also for maintaining productive efficiency. The more important point at issue in most underdeveloped countries is poverty and disparities of income.

Attempts have been made for a schematic presentation of the possible pay-off of certain pervasive programmes which largely benefit income groups as well as intended target groups and restricted positive or curative programmes intended for specific target groups. Schematic presentation of the extent of population likely to be benefited in relation to costs of specific programmes has also been examined. It has been concluded that programmes of leakage and wastage of nutrition are perhaps better endowed with elements of modernization and social change that can ensure self-sustaining growth than direct nutrition intervention programmes themselves. As a prerequisite it is important to investigate the relative importance and dimensions of the holes in the leaking human bucket to arrive at notions of what programmes, at least cost, will confer the greatest benefits.

6. Planning Evaluation Organisation: Evaluation of Family Planning, Planning Commission, Government of India Press, Faridabad, 1967.
7. Sengupta, S. K.: Schemes to study the Economic impact of National Malaria Eradication Programme, Tuberculosis Control and Filariasis (Mimeograph), 1973.
8. Towel, W. J.: Measurement of Health Service delivery effectiveness. SEA/Hlth Ser. Study Sem, 7, January, 1974, 6 p.

The purpose of this paper is to derive, analyse and discuss with an example, some simple expressions for use in the measurement of health service effectiveness. The analysis and expressions are intended to permit evaluation of the relative effectiveness of different health systems or sub-systems; to guide policy determination at the executive level of health services; and to guide the data collection for operational studies contemplated for the future.

The approach tackled makes use of simple probability theory using Venn diagrams and set theory. This approach is intended to be understood by those not normally familiar with approaches. The resulting expressions could be analysed using complete data for the health system, sampled data or professional estimates. These data are expressed as probabilities or percentages.

The paper has demonstrated that a simple global expression for health system effectiveness is possible. A key feature of this measure is that is output-oriented based on the health status and services rendered. The measures of effectiveness are actually probabilistic statements, are simple to use and require little data. The system measurement is confined to governmental health services but shows the impact of the total health service on the population. The definitions required for preventability, benefit and

need; forces policy-makers to define what they really expect of the health system. The model can be used both for comparative and absolute evaluation and implicitly raises some vital policy questions for health service objectives.

9. United States (Nations): Programme of Technical Co-operation. An evaluation of the family planning programme of the Government of India. Report TAO/IHD/50. ST SOA/SER. New York, Nov. 24, 1969. (i), III, 109 p.

An evaluation of the family planning programme, report prepared by United Nations Advisory Mission whose members studied India's family planning programme at Centre-State, and subsidiary levels, 1969. Sections include: Statistical overview of the family planning programme; contraceptive methods; social welfare aspects of family planning; the measurement of demographic change in India; Summary of recommendations, Selected references (pp. 96-99).

D. MATERIALS PLANNING AND INVENTORY CONTROL

1. Administrative Staff College of India, Ministry of Health, Government of India, Report No. 2, Central Government Health Scheme, December 1971, 8 p.

The purpose of this report is to give details of its findings and recommendations emerging from the study in the area of Dispensing Stores Systems and Inventory Planning. It also gives the progress of implementations in Patient-Attendance and Recording and Reporting system.

It has been found that the number of indents sent every month from various dispensaries is very large. The number of supplementary, urgent and local purchase indents run into a large figure of 1,200 indents per month. Such a large number of other indents indicates chronic stock out of items, practice of indenting medicines outside the regular list of formulary and lack of inventory planning and control. This also increases the workload at the stores as well as in each dispensary. In the existing indenting system, the storekeeper does not have a realistic basis to estimate his requirements of medicines and uses the standard formula or past consumption plus 10 per cent, subject to maximum and minimum limits. Present indenting documents call for information on past consumption, existing balance, past receipts, etc. for every time and, thus, increasing workload quite considerably on the storekeepers. The average stock outs at any time constitute about 15 per cent of the items and these stock outs are found to be coupled with surpluses at other dispensaries. There is also a lack of inventory planning. One of the major weakness of existing system is the lack of demand forecast, based on disease trend analysis and preparation of budget for expenses of medicines at dispensary level based on such forecast. Local purchase items cause uncertainties in issue of medicines to the patients who have to wait for the medicines.

In the new system, it has been recommended to constitute a 'Review Committee' to make annual demand forecast at the dispensary level consisting of all medical officers and store-

keepers. The items on the agenda of this committee are to be the reviewal of the consumption of medicines and preparation of demand forecast based on the disease trend analysis of the previous year. Regular indents should be issued every month on the basis of above prepared annual demand forecasts. Maximum and minimum limits are to be fixed by the medical incharge, the maximum limit does not go beyond two months consumption and minimum limits one months consumption. A new card is to be introduced for indenting procedure. Inventory planning on realistic basis, annual budgets at dispensary level, participation and involvement of medical officers, reduction of workload and control on indents introduced are the main advantages of this proposed system.

2. Indian Statistical Institute, Systems Manual on Diet Planning, production and distribution at the Safdarjang Hospital, New Delhi. Indian Statistical Institute, SQC Unit, New Delhi, December 1967, 7 p.

The present report after reviewing the present procedure for diet planning, production and distribution presently prevalent in the Safdarjang Hospital, New Delhi, it points out the draw backs of the procedure in vogue and suggests an alternative procedure that would free from these draw backs.

The modified procedure developed for diet planning programme and distribution is based on detailed statistical analysis of one year hospital data related to (i) number of patients at different according to mid-night census, (ii) in-flow and out-flow of patient at different periods of the day, and (iii) different types of diets prepared. From the hospital mid-night census data on patients, it has been found that the number of patients on any day is correlated to average number of patients during the past three-year days and therefore concludes that it is possible to predict within known limits of accuracy the expected number of patients on the fourth day. It is on this statistically established phenomenon that the proposed procedure for diet planning, production and distribution was worked out.

The entire procedure is devised in such a way that the chances of meeting the diet requirement of the wards is 99 in 100 with provision to carry over the diet of stock. A number of ready reckoners have been worked out to reduce the numerical calculations and clerical work.

3. Indian Statistical Institute, Report on Inventory control in linen stores at Safdarjang Hospital, New Delhi. Indian Statistical Institute, Statistical Quality Control Unit, New Delhi, April 1968, 6 p.

The objectives of this report were to determine: (i) the requirement of important linen items for the entire hospital, (ii) devise an optimal policy of replacement for linen items, and (iii) estimating the life on the linen items.

The requirement of the important linen items for the entire hospital was calculated on the basis of the approved scale and the bed strength for different categories of patients male, female and children. It was decided to forecast demand three months before the expected demand and the same to be ordered four times a year. Based on the study a replacement policy of linen was suggested. A simpler recording of system based on one register, as against number of registers used currently, was also suggested.

4. Indian statistical Institute, Inventory control of X-ray films at Safdarjang Hospital. Indian Statistical Institute, Statistical Quality Unit, New Delhi, May 1968, 4 p.

This study on Inventory Control on X-ray Films has been undertaken at the suggestion of the Hospital Administration. The hospital uses about 500 X-ray plates of twelve different sizes daily. The approximate daily consumption cost of X-ray films is Rs. 1,500. There are several drawbacks in the present system of stocking. The X-ray department frequently faces shortages of X-ray film for various sizes and if there is shortage in one size, the X-ray department is left with the alternatives to meet the demand by using the next bigger size or cutting a bigger plate into two or more smaller pieces. Besides shortages in some sizes, there is over stocking in some other sizes.

The average lead time, which is the time interval between the day of placing an order and the day of receiving the goods has been computed from supply record of past two years for different suppliers. Daily consumption figures of different sizes for the months January to April, 1968 were used to determine the average and maximum daily consumption of X-ray films for the central X-ray department and also for the orthopaedics ward. Using the average lead time and consumption rate, the ordering quantity and reorder level for each item has been calculated by using the standard formulae.

The proposed inventory control procedure has been worked out in such a way that the cases of stock outs will be almost nil. The average inventory will be reduced by about 60 per cent if the proposed inventory control procedure is implemented. The present average inventory is of about Rs. 41,000, as against an estimated average of Rs. 17,000 in the proposed system.

5. Indian Statistical Institute. Inventory Control in the shoe store at Safdarjang Hospital, New Delhi. Indian Statistical Institute, Statistical Quality Control Unit, New Delhi, July 1968, 4 p.

This study determined optimal ordering policy for footwear that would minimise the shortages and inventory. It also devised a proper storing and distribution procedure so as to streamline the working of the store.

6. Indian Statistical Institute. Inventory Control in the General Stores at Safdarjang Hospital, New Delhi. Indian Statistical Institute, Statistical Quality Control Unit, New Delhi, September 1968, 10 p.

The aim of the study was to specify inventory control schemes for different items, adjusting the schemes when consumption pattern shifts and lastly lay suitable operating procedures for the inventory control system.

The inventory control procedure worked out for the important items in the general stores is according to the two-bin system where an order will be placed when after the stock reaches a particular pre-determined level.

There are in all 240 items in the general stores out of which only 216 are recurring type and these have been divided into A, B and C have an annual consumption value of Rs. 97,000, Rs. 26,500 and Rs. 36,834 respectively.

The proposed inventory control system has come out with the following results. The total number of orders to be placed in a year is about 350. Once the inventory control system has been implemented, the average inventory will come down from the present level of Rs. 72,000 to Rs. 38,000. The inventory control system is so worked out that instances of stock-out will be almost nil and the number of orders that have to be placed will be minimum. According to the proposed system the stores department themselves would also estimate the annual requirements of different items. Number of specific suggestions for the operation of the system were given.

7. Khan, Abdul Basit: Inventory optimization in central drug stores and blood bank of a hospital. Thesis submitted for the degree of M. Tech. at IIT, Delhi, July 1974, 128 p.

This study has been carried out to determine the categories of drugs required, and specifying the quality and quantity required so that a good system of inventory control is developed so as to keep inventories as low as possible. Another study about inventory

analysis of Safdarjang Hospital Blood Bank has also been undertaken to develop procedures leading to stability in order schedules and to eliminate extreme fluctuations in inventory while minimizing the risk of shortage or expiration on the blood shelf. The first problem also relates to Safdarjang Hospital.

Considering the nature of the items and non-profitability motive of the set up, it was concluded that the conventional treatment of inventory analysis was not suitable. Shortages in situation like drug store was inevitable due to the constraint imposed by less financial allotment. As a result, the investigation of cost of shortage was meaningless. Then a suitable mathematical model was constructed and forecasting was done by the method of least squares. Optimal policy curve was drawn and ordering cost based upon the present cost was calculated. Certain recommendations were made in order to improve the efficiency of the central drug store.

Regarding blood bank problem an attempt was made to evaluate the mean level of inventory, average of blood when infused and average number of units short or expired. Again in this case, a mathematical model was constructed based on the frequency distributions of the parameters for each type of blood for a specified Rh factor. Three curves were drawn, denoting the effect of N the number of days of average demand giving the inventory level of the bank, on the percentage shortage and percentage expiration. The results obtained by simulation were given in the tabular form. It was evident from these tables and curves that with increase in inventory levels the percentage of shortages tend to diminish and percentage of expirations increase and if the inventory level is lowered, the opposite effect is noted.

8. Luther, N.: A study of the management of 'Medical Stores' in All India Institute of Medical Sciences Hospital with special reference to Inventory control. MHA Thesis, AIIMS, New Delhi, August 1973, 141 p.

The existing procedures for purchasing, receiving, stocking and utilization/consumption etc. of AIIMS Hospital were revised. Measures were suggested for improvement in the areas of purchasing, receiving, storekeeping, issuing, consuming and utilising the scraps and also managerial control overall these activities.

The study brought out that the administrative lead time for procurements is very long resulting in untimely supplies. The inventory control techniques are not in practice. There is no review system for the consumption trend of the drugs. Decisions on purchases are taken without reviews, resulting in locking of

the capital. More specifically, materials planning and budgeting may be done systematically by A. B. C. analysis and Inventory control techniques to be employed for A items in the first instance to be extended to B items gradually.

9. Nagpal, A. K., Achuth Kumar, T. A., Sriram, K. S. V., Singh, J. B.: Materials Management Systems Redesign. Post-Graduate Institute of Medical Education and Research, Chandigarh, 1973, 10 p.

The objectives of the study are to study the existing system of receipt, storage and issue of materials and attempt to design an improved system, to develop a proper stores accounting system, and to simplify the existing purchase procedure.

The present system was critically examined and a few deficiencies were highlighted. With a view to effect better control and render quicker service to the departments and also to ensure an overall economy, the purchase and storage of material were centralised. Systems approach to material management of function was employed to bring about further improvements in the methods and procedure.

The investigation carried out has recommended that the purchases be made on the basis of the estimated requirements obtained from the consumption norms and the budget allocation. The study had redesigned some forms which should be used in the purchase section in place of the existing ones. The correspondence and control cell should be set up for effective supervision and following purchase cases. The various items be coded for simplification of receipt, and issue of material. The modified indent forms and issue not be used so as to facilitate mechanization of the inventory management. The stores accounting be mechanised through the ADP for which facilities are already available at the institute. Lastly it has suggested that the task of inventory control be carried out by the ADP while giving feedback to the purchase section regarding reorder points, at periodic intervals.

10. Nagpal, A. K. and Sharma, A. L.: A case study on material management system; An integrated approach. Post-Graduate Institute of Medical Education and Research, Chandigarh, 1973, 1 p.

The present study carried out at the Post-Graduate Institute of Medical Education and Research, Chandigarh and the attached Nehru Hospital explains how a proper material management system should be designed so as to result in a minimum purchasing inventory costs and at the same time exercise considerable

economy in the use of raw materials so as to reduce the strain on expenditure more than what one could envisage.

The technique employed here was the integrated approach, according to which the purchasing, storing utilisation of the materials involved are brought to the concern of a single department constituting material management so as to give greater importance to the three aforesaid functions. Incorporating the concept of selective control in the total system, the materials required, to be carried as inventories were classified under various groups according to some specified parameters. VED and SDE analyses were carried out for the purpose of selective control and certain vital and scarce items were carefully defined that could accommodate any function in the lead time of the consumption. Having known the anticipated consumption of various items the particular category of items involving an annual expenditure of more than Rs. 10,000 were taken for selective control to ensure economy in purchases. Efforts were made to reach the manufacturer thus eliminating the middle man's profit. Since there was a considerable room for ensuring economy in the use of materials it was suggested that application of principles of "Waste control" and use of cost reducing techniques like "value analyses" could reduce the strain on expenditure more than what one could envisage.

11. Nagpal, R. L. : A study of the management of surgical stores (consumable)" in All India Institute of Medical Sciences Hospital, New Delhi with special reference to Inventory Control. MHA Thesis, AIIMS, New Delhi, 1971, 96 p.

The present study is carried out in "surgical stores (consumables)" with special reference to inventory control.

The policies, procedures and practices at present in force in the management of surgical stores were reviewed entailing the perusal of policy manuals, letters, memoranda etc. and personal discussion with the personnel working in the stores. Based on data collected for the year 1969-70 from the various records, ABC analysis of items were performed in addition to examination of certain Inventory Control techniques for their implementation. Some suggestions for the operation of medical stores were recommended so as to improve its efficiency.

E. WAITING LINE STUDIES

1. Administrative Staff College of India, Ministry of Health, Government of India. Report No. 1, Central Government Health Scheme, November 1971, 12 p.

Objectives of the study are to undertake detailed and comprehensive activities analysis of or different points of the patient's flow in CGHS dispensary there in and to recommend improvements.

There are in all six queue points namely, registration, consultation, dressing section, pharmacy etc. and if a patient needs all the services he has to be in queue at all the six points. Waiting period of the patients further get increased due to restricted medicine system. To overcome these difficulties, a new system has been described in which it has been suggested that new beneficiaries should be allocated permanently to the doctors and there should be only one prescription slip. In the new system, registration of patients is not necessary and all the cases are to be fixed separately for each doctor, for a period of three months. Certain advantages of this system are the reduction of waiting time of the patients and better doctor patient relationship. Clerical workload is also reduced. Regarding reporting and recording system, it has been found that the quality of the statistical data is very low. It has been recommended to maintain the prescription slip of a running case with the doctor, till the case is terminated. Disease statements/morbidity records are to be prepared by the clerks on the prescribed forms and daily summary shall be maintained for each doctor. It is always advantageous to adopt the new reporting system since it does not entail any additional cost.

2. Desai, V.A.: A study of waiting time of outpatients (speciality clinics) at All India Institute of Medical Sciences Hospital, New Delhi. MHA Thesis, AIIMS, New Delhi, 1970.

The study attempts to find out average waiting time of patients at the four special clinics viz. chest, cardiology, gastro enterology

and endocrinology at AIIMS hospital, New Delhi and suggests ways and means for overcoming bottlenecks of any which will result in the improvement of functioning of these clinics so that waiting time can further be reduced and thereby improving the community image of the hospital.

The study was conducted for a period of three months where each clinic was covered for three weeks and all the patients who attended were studied.

The study reveals that the arrival pattern of patients was erratic and early arrival was causing congestion and confusion and was influencing the waiting time of the patients. It was also revealed that the waiting time was to a certain extent influenced by the patient load and actual starting time of registration. Other reasons include late starting of registration and clinics and lack of any system of control and supervision.

The suggestions for improvement in waiting time include block appointment system, starting of registration and clinics on time, streamlining the procedure of distribution, posting of full time staff, provision of space for records and exercise of control.

3. Dunai, S. C. : A study of the development and Improvement in the out-patient services in the AIIMS Hospital, New Delhi. MHA Thesis, AIIMS, New Delhi, 1968, 94 p.

The present study investigates the working and assesses efficiencies of the out-patient services in the AIIMS Hospital by introducing an appointment system on a restricted basis, as an experimental model in one of the busy and crowded clinics of the out-patient department. The study further suggests steps to develop and improve the out-patient services on sound and scientific lines and that would reduce the overcrowding and waiting period of out-patients by operating quick, better and modified facilities and methods.

An appointment system was introduced on a limited and restricted scale on an experimental basis in the ophthalmic clinic of the out-patient services in the AIIMS. The out-patient on his initial visit to the ophthalmic clinic, is given the data and time of appointment when he will be seen by the doctor, indicating the cabin number where he will be examined. A provision for examination of about 160 cases, 80 new patients and 80 old patients, is made for each session of the morning clinic.

The study has revealed a number of factors bearing on the effectiveness of the appointment system. It is felt that some of the

factors which are responsible for hindering the effectiveness of this appointment system are beyond the control of the administration and these do result in waiting for a while.

There, however, has been more satisfaction to the patients from this system. The study revealed that the appointment system introduced in the ophthalmic clinic even though for a small period of six weeks was successful judging from the results it achieved during the experimental period.

4. Indian Statistical Institute: Utilisation of machines and waiting lines in X-ray unit at Safdarjang Hospital. Indian Statistical Institute, Statistical Quality Control Unit, New Delhi, June 1968, 4 p.

The purpose of the study was: (i) to determine the utilisation of machines in the X-ray unit, (ii) to get a causewise breakdown of non-utilisation and lastly, and (iii) to determine the extent of waiting time and size of waiting lines.

The working time of X-ray unit was divided into six time intervals, five of one hour duration and one of one-and-a half hour duration. Data was then collected from the eight X-ray rooms to know the number of patients waiting outside each room, whether the machines is being utilised or not and if not utilised the cause of non-utilisation. The data obtained in this manner was analysed to obtain average number of individuals in the system outside each room for each of six time intervals, the average waiting time for an individual coming for advise for each room and for all the time intervals lastly the percentage utilisation and the contribution towards non-utilisation of the different causes were also computed for each of the time intervals.

The results show that there is a lot of variation in respect of queue length between rooms within the same time intervals and between time intervals within the same room. As a consequence of this the average waiting time also varied. The overall utilisation was 41.67. The major causes of non-utilisation are 'no patient' and 'radiographer out'. They are responsible for about 80 per cent of the total non-utilised time and the machine is idle for 26.8 per cent and 22.2 per cent respectively of the total time because of these. The study suggested measures for reallocation of patients among different machines and among which copied to return for waiting time as patient continuously.

5. Mehta, P. L. : The out-patient department of Western Railway Hospital, Partapnagar, (Baroda) - A Study Report. SCAAN Journal, May 1974, p. 14-16.

The study reveals that with minor improvements and modifications of the waiting time of a patient in the out-patient department can be reduced considerably from 43 patients to 21 patients on an average.

6. National Institute of Health Administration and Education, New Delhi: Report of a pilot study of Orthopaedic OPD of Safdar-jang Hospital, NIHAЕ, 1969, 22 p.

The objectives of the study were to investigate the functioning of orthopaedic OPD in terms of waiting times etc.

To assess the pattern of services rendered and utilized retrospective study of the registers and records of the out-patients was taken. A systematic sample of medical records of patients attending the OPD during 1968, with a sampling fraction of one in twenty was taken and their data was collected from these records. Workload and staffing pattern were determined after studying the various registers kept in service areas. To assess the work situation, the physical lay-out of the department was studied quite thoroughly. A proforma was used for recording observations regarding the arrival of patients and plan service the personnel working in various service areas.

It was found that a new patient spent on average 146.0 minutes in the OPD and old patient 133.5 minutes. Large amount of cross traffic was taking place as a consequence of the present location of physical facilities but the existing staffing pattern was adequate to meet the workload. The long waiting at X-ray and plaster units was due to the use of outmoded equipment which hampered quick disposal of patients. Many suggestions were made regarding an appointment system changes in longest reallocation of force in the flow of patients etc.

7. Ramaiah, T.J.: Computer simulation of an ambulatory care facility for dynamic determination of physician staffing level. A paper presented to a seminar on Quantitative methods in Health Services, January 1974, 19 p.

The present paper attempts to determine an optimal physician staffing pattern for an out-patient facility based on a dynamic administrative policy through simulation. The objectives are to develop a simulator that schedules the walk-in patients to a physician-on call dynamically, given a 'signal' based on the length of the queue that has formed at the offices of the regular physicians on duty, and identifying an optimal dynamic scheduling system from amongst ten different systems of organisations and lastly for determining the optimal physician staffing level that minimized the total cost of idle time of facilities and waiting time of patients.

The average total patient load per day at the clinic under study is about 127 with three physicians on duty, out of which six patients are for routine physical examination while the rest are for treatment or consultancy. The arrival time distribution of appointment patients, with respect to their appointment time has been found to be following normal distribution. However, the service time distribution at screening is a Gaussian distribution. A simulation model has been framed where a number of single channel, single-server and single-channel, multiple server processes are arranged in sequence. Number of entities; namely functions, parameters, facilities, storages, queues and tables, required for the model, have been defined using the data collected from the primary care clinic. Further, the simulation model has certain features built into it namely the priority system for appointment patients, lunch-breaks, working hours, etc. The author has presented the detailed aspects of the construction of such a model with GPSS III for the ambulatory facility under study.

The paper concludes that corresponding to the level of queue length 20, all the patients are equally distributed between the available physicians where each physician is expected to examine both categories of patients. It has been found that the second level of physician staffing has higher expected waiting time than the first at registration, admitting, screening and chart as a consequence of higher demand for services, on the other hand, the same had lead to reduction in the average waiting time at each of the physician's offices because of reduction in the patient load per physician. Service timings for all the four physicians have also been found. The average waiting time of patients at physicians' offices has consistently decreased with the decrease in the level of the queue length.

8. Sinha Roy, M.: A study of waiting time of patients at All India Institute of Medical Sciences Hospital, New Delhi, MHA Thesis AIIMS, New Delhi, 1969, 151 p.

The study attempts to determine the average time taken to clear the patient in the different departments of the out-patient wing of the hospital and also attempts to locate the bottlenecks, if any, that will enable the out-patient wing to function smoothly.

Based on the units of a pilot study two of the clinics General Medicine and General Surgery were included for the main study as these two clinics between themselves accounted for a significant portion of out-patient attendance daily.

The study observes that the patients who arrived before

8.00 A.M. had to wait on an average for 38 minutes. This waiting time progressively decreased for patients who arrived subsequently. Those who arrived between 8.00 and 8.30 A.M. had to wait on an average 16 minutes compared to 10 minutes, and 6 minutes, and 4 minutes, respectively for patients who arrived during the next 4 half hourly interval.

The study has suggested a number of remedial measures aimed at reducing the waiting time of patients, for sowing the congestion programme at X-ray and registration counter.

F. HEALTH MANPOWER

- 1✓ Anand, T.R. : Medical manpower Planning in India. Thesis for Doctor of Medicine in Community Health, University of Delhi, 1970, 135 p.

The study consists of the estimation of the current supply of active physicians in the country of medical teaching manpower and its relationship to the needs of medical education and the study of the profile of applicants for post-graduate medical education. The study is limited to allopathic physician holding a diploma, degree or a post-graduate qualifications in any branch of allopathic system of medicine.

For the purpose of estimation of current supply, the stock physicians in 1961, based on last census has been used as the benchmark. Information regarding certain facts of migration of doctors has been taken from the scientist pool maintained by the Council of Scientific and Industrial Research. Census of Indian Life Tables 1951-61 for males have been used to estimate the survival rates of supply. So far retirement is concerned, doctors above the age of 65 years have been taken as retired. International migration of doctors have also been studied. The study of medical teaching manpower has been based on data on medical teachers available, University Grants Commission and the Medical Council of India.

✓ The Central Zone had 14 per cent of the stock of allopathic physicians in India. The doctor population ratio was the lowest in this zone. This zone was lagging behind the rest of country in the medical education facilities also. The Eastern Zone had 242 doctors per million population, which is very close to the national average. The medical college population ratio was fairly low; there were only 0.62 medical colleges per 5 million population. The shortage of medical teachers was also considerable. The Northern Zone has the best doctor-population ratio. There were as many as 306 doctors per million population. This zone had more than one college per 5 million population. The Southern Zone had the maximum percentage of stock of doctors i.e. 27 per cent.

The doctor-population ratio per million population is well above the national average. There were more than one medical college for 5 million population. The Western Zone had 299 doctors per million population. This zone had the maximum number of colleges per 5 million population. The admissions per million population were as high as 30.

The doctor population ratio for the country as a whole, was 241 per million population i. e. there was one doctor for 4, 150 population. The total stock of allopathic physicians was about 126,000 in 1970. The number of medical colleges per 5 millions population was less than one.

2. Andhra Pradesh Planning and Co-ordination Department:
Medical and health manpower in Nellore District, Hyderabad.
Manpower Documentation, Vol. II, No. 1 and 2, January 1972,
IAMR, New Delhi.

These documents describe the stock of all categories of health personnel in two districts of Andhra Pradesh. The data relating to: (1) General Geographical and demographic features of the District, (2) Medical and Health facilities, (3) Medical personnel, (4) Doctors of all systems of medicine in the private sector, (5) Nativity of doctors, (6) Sex distribution of doctors, (7) Age distribution of doctors, (8) General and professional qualifications of doctors, (9) Para-medical personnel: compounders, pharmacists, technicians, and (10) Para-health personnel: health and sanitary inspectors, health assistants and vaccinators, non-medical assistants and health visitors are presented.

3. Basu, R. N.: Requirements of nursing personnel for the national family planning programme. Journal of Family Welfare, 1967, 13(4), 36-40.

Role of nursing personnel in family programme is discussed along with their categories and contribution programme.

4. Indian Statistical Institute, Study on work measurement-pharmacy at Safdarjang Hospital, New Delhi. Indian Statistical Institute, Statistical Quality Control Unit, New Delhi.

The present study was conducted to find out the work distribution and, to evaluate the staffing pattern essential to run the pharmacy in an efficient way.

The activities of the pharmacists engaged in servicing the three pharmaceutical departments namely Main OPD, Gynaecology OPD, and Children OPD were studied based on time study. The

average normal and standard times of the three pharmacies were obtained for different operations like distribution of tablets, distribution of mixtures etc.

The study revealed that the present number of pharmacists in the three pharmacies is 13 as compared to the actual requirement of 11 pharmacists. The study further states that as a result of the proposed deployment of pharmacists, the pharmacists will be idle for 25 per cent of the time and suggested that this idle time could be used for the work concerning with inventory control.

5. Institute of Applied Manpower Research, New Delhi. Health and medical manpower: Manpower requirements of the Family Planning Programme. IAMR Working Paper No. 1, 1968.

The study examines manpower needs during 1966-71, likely growth in manpower stock according to current educational and training facilities, the likely availability of manpower for Family Planning activities with reference to specific demands such as for women doctors and lastly the ways and means of ensuring optimum distribution of available manpower for meeting the needs of the family planning programme.

The study had adopted a selective approach in that there are some specific areas, sections and groups of population which contribute to the faster growth of population and hence they should receive special attention in the family planning programme work; and their characteristics, including socio-cultural traditions and behaviours needed careful study.

It is estimated that the total manpower requirement for family planning programme during 1966-71 is about 121 thousands. The requirements of Doctors and ANMs and Health Visitors are 9,700 and 39 thousands respectively. The plan reveals yet another important fact that the family planning programme is likely to be handicapped by the non-availability of women doctors particularly in rural areas and has suggested some action programmes. The paper advocates the need for a continuous review of the programme from the manpower angle, so that imbalances and deficiencies are located in time and remedial action taken to remove them.

6. Institute of Applied Manpower Research, New Delhi: Demand for nursing personnel for Fourth and Fifth Plan Periods, IAMR Working Paper No. 7, 1969 (revised), 43 p.

This paper has estimated the demand for nurses and auxiliary-nurse-midwives in India for the Fourth and Fifth Year Plans. The

demand for nurses has been worked out by component approach, the components being: (i) care of beds in hospitals and dispensaries, (ii) family planning, (iii) administration, and (iv) teaching. For the first sector, the nurse-bed ratio has been used. The demand for nurses for family planning has been estimated by adopting the staffing pattern for the various organisations of family planning. For administration, the demand for nurses has been estimated by considering the size of hospitals and taking into account the recommendations of the Indian Nursing Council. The demand for nurse-teachers, has been estimated by using teacher-pupil ratio. The total demand as obtained by adding the demand in each of the four sectors is then compared by using three overall ratios, viz.: (i) nursing-population ratio, (ii) nurse-doctor ratio, and (iii) nurse-health expenditure ratio. Demand for auxiliary-nurse-midwives has been estimated by using programmatic as well as normative approach. For the Fifth Plan, normative approach only has been used as no programmes are known for the Fourth Five Year Plan.

The demand for nurses for the Fourth and Fifth Five Year Plans has been estimated to be of the order of 89,000, 96,700 respectively. But tentative calculations have revealed that about 80,000 and 1,05,000 nurses are likely to be available at the end of Fourth and Fifth Five Year Plans respectively resulting net shortage of 9,000 nurses at the end of Fourth Five Year Plan. The demand for auxiliary-nurse-midwives has been estimated as 67,000 and 74,000 at the end of Fourth and Fifth Five Year Plans respectively resulting a shortage of 22,000 at the end of Fourth Five Year Plan.

7. Institute of Applied Manpower Research. Demand for Doctors for Fourth and Fifth Plan Periods, IAMR Working Paper No. 2, 1969 (Revised), 1970.

This paper presents estimates of the demand for doctors in India for the Fourth and Fifth Five Year Plans. The term "doctor" as used in the study includes only those who have a licentiate, graduate or post-graduate degree in allopathic system of medicine.

Estimates of demand for doctors were made earlier by different organisations in the country. They were based mainly on an overall doctor-population ratio. A health programming model known as Component Method was used for introducing refinements in methodology. The components considered were: (i) employees in hospitals, dispensaries, primary health centres etc., (ii) doctor-teachers, (iii) doctors primarily engaged in family planning programme, and (iv) doctors doing private practice.

The paper has estimated that the total number of doctors required for the Fourth and Fifth Plans would be of the nature of 143,000 and 179,000 respectively. While the number of doctors likely to be available would be of the order of 138,000 and 174,000 respectively resulting in a shortage of 5,000 doctors in each of the plan periods.

8. Institute of Applied Manpower Research. Supply of doctors during Fourth and Fifth Plans. IAMR Working Paper No. 3, 1971, 38 p.

The present paper attempts to estimate the supply of doctors during the Fourth and Fifth Five Year Plans. The term "doctor" used in the paper includes those who has either a licentiate or a graduate or post-graduate degree in allopathic system of medicine. A method called "Indirect Method" has been used for estimating the number of doctors which is based on the individual factors that cause additions to, or withdrawals from, doctor supply during a period of time. The estimate of the supply is then obtained by pooling together the various components. The various factors relevant for the proposed study were institutional outturn of doctors, mortality, impact of partition of the country in 1947, international migration and adjustment for first degree holders from abroad. Some methodology was applied for working out the future supply of doctors for the period 1969-78. A careful study of the various estimates would reveal that each of them has some limitations and certain adjustments have been made for them. It is estimated that the number of doctors would increase from the range 106,300-111,900 in 1969 to 189,500 in 1978.

9. Institute of Applied Manpower Research. Utilisation pattern of nursing personnel at Willingdon Hospital. IAMR Report No. 2, 1973, 53 p.

The study was carried out to develop manpower norms, if possible, separately for the requirement of nurses based on essential nursing functions envisaged in the wards and in other units, and utilisation of these findings for studying the nursing personnel requirements at different levels. Ratio delay technique and continuous study technique were used for work measurement.

It was found that overall utilisation of sisters in wards, OPD and emergency was 77.0 per cent, 79.7 per cent and 81.2 per cent respectively. The current system of supply and accounting of drugs should be reviewed so that sister's time and skill are used more effectively. Sisters were spending about 19.8 per cent and 15.5 per cent of their time in off-station activities in wards and emergency respectively. Similarly, utilisation of nurses in the morning and

evening shifts was almost equal (78 per cent) and were found off-station for a considerable period of time.

- ✓ 10. Kalra, V.B.: Study of nursing services in Delhi Hospitals with particular reference to working conditions, turnover and effective utilisation of Nurses, MHA Thesis, AIIMS, New Delhi, 1968, 143 p.

The nursing service of hospitals located in Delhi were studied with particular reference to working conditions, turnover of nurses, and their effective utilisation in the AIIMS Hospital.

Information for the same was collected from records and by interview of matrons, supervisors, ward sisters and staff nurses. In addition, a time study was conducted in two wards of AIIMS Hospital to assess the time utilisation of nurses using intermittent instantaneous observation technique.

✓ The study finds that the functions of matrons and assistant matrons are overlapping. Job description for these two positions would help to avoid this duplication. The present status of the matron is not conducive to good administration of the nursing service. Matrons conferences are not being held. The present nurse patient ratio is below the accepted ratio of 1:3. Orientation of new nurses and in-service training of the entire nursing and auxiliary nursing staff are very inadequate. Ward sisters were spending no time on evaluation of patient care and spend very little time in teaching activities.

11. Kohli, B.R., Sharma, B.B.L. and Goel, O.P.: Assessment of Statisticians of regional family planning training centres. Central Family Planning Institute, New Delhi, April 1971, 9 p.

The paper presents the results of pre and post test as an evaluation method of a training programme organised by the Central Family Planning Institute from September 7 to 24, 1970 for the Statisticians of the regional family planning training centres.

A questionnaire containing questions on demography, family planning, social research, medical, communication, curriculum development and teaching was administered to all the statisticians before the commencement of the course. The same questionnaire was repeated at the end of the course. This was to ensure all possible opportunity and facility to the trainees to demonstrate the knowledge gained in the various areas. It was observed that the overall gain in all the subjects was of the order of 14 per cent. Demography and Statistics showed the highest gain of 16 per cent,

whereas medical genetics showed the lowest gain of 9 per cent. The Chi-square test showed that training had significant effect in demography, but in other subjects the effect of training as exhibited in the post test, was not statistically significant at 5 per cent level. The overall chi-square test for all subjects (combined) showed a significant effect of training at 5 per cent level.

12. Ministry of Finance, Government of India, Report on the work study of the Central Government Health Scheme, Part I.
Ministry of Finance, Government of India, 1971, 8 p.

This is a study for development of staffing norms for allopathic dispensaries under Central Government Health Scheme in Delhi. A pilot study was conducted in two dispensaries to identify the jobs that take most of the time and to find out how the jobs were being performed. The elements of each job and the performance procedures were discussed in detail with the medical officers, para-medical and other staff. On the basis of this pilot study, the format to draw work samples of medical officers, pharmacists dresses were drawn. Time-studies were conducted in two dispensaries. As the jobs done in the dispensaries were of a uniform nature, the techniques of time study and synthesis were adopted for measuring the time for different jobs.

It was calculated that a medical officer spent 2.28 minutes per patient on average. The average time per visit to a patient's residence was ten times. A medical officer spent on an average 68 minutes per day on supervision, correspondence, signing documents for stores etc. A pharmacist took 2 minutes, on an average, per prescription. Similar timings were also calculated in case of dressers, staff nurses, medical storekeepers, laboratory technicians, clerks and Class IV employees. About 3 per cent of the number of beneficiaries, on an average, utilized the facilities. For every addition of about 115 patients in the average daily attendance, one more medical officer would be required.

13. Raghava Rao, S. V.: Study of activities of nurses in All India Institute of Medical Sciences Hospital, New Delhi, MHA Thesis, AIIMS, New Delhi, Jan. 1973, 160 p.

The objectives of the study are to find out the every day activities of nursing personnel in four in-patient units (total activities), to work out the percentage distribution of activities in each area-activity wise, and category of personnel-wise, to analyse different types of activities in different units and to work out the non-bed side activities performed at present by the nursing personnel and lastly to sum up the activities which could be performed by personnel, other than of nursing.

For the purpose of study four general units (in-patient units) which are a sizable representations for the general nursing activity were selected. Simple random sampling technique was used for recording the activities of the nursing personnel involved. The activities recorded were grouped under different categories with the help of coding which was evolved on the basis of a WHO study. A questionnaire-cum-interview schedule was evolved and their opinions regarding problems and suggestions were obtained.

The study observed that the bed side nursing care was not at all being given by them and as such the basic needs and comforts of the patients were not being attended to. Evaluation of patient care and health education in the wards were also not undertaken. About 40 per cent of the activities of the staff nurses were spent on 'other centered activities' out of which maximum was the clerical work.

14. Sanyal, A. K. : Study of absence amongst house-keeping staff of All India Institute of Medical Sciences Hospital, New Delhi, MHA Thesis, AIIMS, New Delhi, Feb. 1971, 123 p.

The study investigated the incidence of absence with and without prior leave application of house-keeping staff and the reasons for the same. The data was collected from daily attendance register, casual leave records from Havildars Office and from the service book of each employee. Two rates, namely, the total absence rate and the unauthorised absence rate were worked out. All the house-keeping staff were interviewed to know how they felt about their work and the reasons for their authorised and unauthorised absence.

About 38 per cent of the absence is due to illness. The other reasons are social cause (33.64 per cent) which the workers consider as social obligation, personal causes (13.32 per cent) which include 'Rest and Recreation' and "Attention to village home" in 11.85 per cent.

15. Sivaraman, P. : A study of turnover among staff nurses in All India Institute of Medical Sciences Hospital, New Delhi, MHA Thesis, AIIMS, New Delhi, 1970, 105 p.

The present study analyses the problem of turnover amongst staff nurses with a view to identify and analyse, the individual and organisational factors associated with it.

Information was collected from exist interviews of separating nurses and their service files. Forty were interviewed during the study period. A predetermined form was structured for the guidance to elicit relevant answers.

The study observed that the influences which encourage or discourage turnover in hospitals flow from a variety of sources; familial, ecological and demographic characteristics together with the emotional and intellectual disposition of staff nurses effecting their decision to continue or terminate hospital employment. The major reasons for the avoidable turnover were better salaries in foreign countries, want of family quarters, lack of promotional opportunities and job dissatisfaction.

16. Thomas, Achamma, Rele, M.R. and Timmappaya, A.: A study of Activities of all categories of Nursing and Ancillary Personnel Engaged in patient care in an in-patient unit of a General Hospital in Delhi. NIHAE Research Report 11, 1972, 208 p.

In this study, the activities of all personnel who are responsible for nursing service in an in-patient unit are analysed so as to determine the types of activities currently performed by each category of personnel in the unit, the percentage distribution of the types of activities, the types of activities that are most time consuming and the amount of nursing activity time spent with the patient and away from patient. The study included ward sister, staff nurses, student nurses, orderlies/ayahs and sweepers/sweeperesses. A comprehensive list of activities was prepared with the help of the information gathered from experienced investigators, literature, pilot observation of personnel at work. The listed activities were grouped, defined and coded. Work sampling technique was used for data collection. The data collected were coded immediately following observation by observers and counter checked by investigators for accuracy.

Based on the findings, the study recommended means for better utilisation of nursing professional skill through better organisation of nursing service activities.

17. World Health Organization, India: Activities of the auxiliary Nurse/Midwife in the State of Haryana, WHO Project, India, May 1967, 10 p.

The present report gives a description of ANM activities in Haryana and is based on the work of two auxiliary-nurse-midwives in each of three primary health centres selected at random a total of 83 centres which employed at least four ANMs as on May 1, 1967.

Officially the length of the work day is 6 hours per day. But ANMs in the study worked from 5.5 hours to 9.5 hours each day, excluding the time spent in personal activities such as shopping, household/chores, feeding their own babies. ANMs working in

sub-centres spent significantly less of their time in the centre and more time on the road and in village homes than ANM's who worked in primary health centre. Ninety per cent of the travel time of ANM is spent on foot. On an average, an ANM visited ten households per day. Actual travel time between homes was brief but long blocks of time were required to go to and fro from one area of working to the other on a given day. The average time spent with a clinic patient was 5.5 minutes and two of the ANMs had very cordial relations with the village people. An ANM gave service daily, equivalent to 9 minutes per in-patient per day. ANMs also spent approximately 30 minutes planning with the teachers or the headmaster of the schools. ANMs also spent small amounts of time assisting the doctors in minor surgery and complicated dressings and in the examination of female patients. Health problems with which ANMs dealt were of the four types: (1) maternity, (2) health supervision and disease prevention, (3) illness and injury, and (4) family planning.

The average home visit for family planning consumed 5.9 minutes and the average clinic contact 3.9 minutes. Most of the ANMs' effort in this programme (78 per cent of their contacts) was directed toward persuading eligible persons to accept family planning service. ✓

18. World Health Organisation (SEARO): Activities of the auxiliary-nurse-midwife in the State of Gujarat, WHO Project, India, Oct. 1967, 11 p.

The present study of ANM activities in Gujarat is based on the work of auxiliary-nurse-midwives in four primary health centres selected at random from a list of 185 eligible centres, all those in the State except centres in Kutch and three in Kaira District with unusual staffing patterns.

When the study was made, immediately after the monsoon, no official ruling on ANM's working hours, applicable throughout the State, was available. ANMs worked from about less than 4.5 hours to over 7.5 hours on a single day excluding time spent on personal activities such as shopping, feeding their own children etc. ✓ ANMs assigned to sub-centres, with one exception, spent significantly less of their time in the centre and more time on the roads and in village homes than ANMs in primary health centres. On 12 of the 45 days observed, ANMs travelled more than one hour at a stretch to reach the village where they were to make home visits. Approximately one-fourth, as many persons as were treated and advised in their own homes, came to the centre and received nursing service from ANMs. ✓ ANMs in two primary health centres gave nursing care to in-patients during the observa-

tion period. They also visited school to impart lessons on personal hygiene, assisted physicians with intravenous infusions, took care of the equipment and premises. A part of ANMs working time was also spent in maintaining records and registers, in receiving instruction from the physician or health visitor. The ANM's working time was also spent in giving instruction to ayahs and in supervising their work, in conferring with village officials, sometimes idle with no arrival of patients and other times conversing with them.

G. INFORMATION SYSTEM

1. Singh, Bhupinder: Development of medical record in the out-patient department of the AIIMS Hospital, New Delhi, MHA Thesis, AIIMS, New Delhi, 1968, 81 p.

The study of the working of the medical records in the out-patient department of the AIIMS was made with particular reference to the various types of folders, cards, forms, investigation steps, which are in vogue at present. In addition it was an experiment with newly designed file folders, treatment cards and appointment cards for six weeks in one clinic. The same was found to be quite useful and successful.

The study has recommended some measures which will help in the elimination of multiplicity of records, in overcoming the space problem for the medical records and for measures aimed at protecting the records from fire and insects and moths.

2. Government of Punjab, Hospital Utilization Study, Punjab, 1969, 2 p.

This paper describes the plan of operations to generate, collate and report hospital utilisation statistics, with particular reference to indoor facilities, when full developed, it is expected to serve as a potential instrument for administrative decision-making and operations research in a delimited area in Punjab State on an experimental basis.

3. National Institute of Nutrition, National Nutrition Monitoring Bureau, Plan of Operation, 1972, 37 p.

Indian Council of Medical Research will be starting a National Nutrition Monitoring Unit in order to monitor the nutritional services through collection and processing of information on the nutritional status and dietary habits of different segments of the population in India making use of standard procedures and techniques. National Institute of Nutrition, Hyderabad would be responsible for the technical direction and overall supervision; co-ordination of the

functions of various units, standardisation of the techniques and methods and analysis of the data. Under this scheme, there will be nine regional units in each of nine major States in the country. Each unit will have some staff provided by ICMR in addition to the staff available with State Nutrition Officer. As a part of this monitoring work clinical surveys, anthropometry, diet surveys and collection of relevant background information would be carried out.

This document clearly specifies the methodologies and instruments for data collection, concepts and definitions etc. including the sampling procedures with illustrative examples.

The data available from this operation would be of immense use for planners and administrators for administering various programmes for improving the nutritional status of the communities. The data available therefrom would also be of use for specific operations research studies that would be carried out eventually.

4. Ramaiah, T.J., Kataria, M. and Radhaiah, G.: Statistical Information System for large, non-teaching General hospitals, Journal of Hospital Administration, Sept. -Dec. 1973, p. 1-12.

This paper presents the current status of medical records; their initiation, flow, storage, retrieval practices and information collected, collated and used therefrom based on a study of 23 large non-teaching general hospitals spread over in five northern States of India. Inadequacies in the existing were many which have been listed. A simple and minimal information system in terms of data and required practices is developed particularly keeping in view the needs of the hospital administration at local level for the management of hospital.

5. Sapru, Rita: The statistical information system of child health services in the USSR, NIHAE Bulletin, Vol. IV, No. 3, 1971, pp. 181-197.

The rapid development of specialities and the complexities of health planning needs to be balanced both externally to fit into the framework of the country's economic development and internally, so that all specialities are represented in accordance with population needs, had given rise to the need for analysing vast amount of data, rapidly and quickly. The validity of health planning upon 'Norms' and 'Standards' from a routine recording and reporting system has been called into question in the USSR is almost complete, there is considerable under registration of acute morbidity. Almost 40 per cent remains undetected and (b) A rapidly changing national economy cause quick obsolescence of 'Norms' and 'Standards' based upon

experiences of the past even if the past is recent. In order to make health planning suited for future need forecasting techniques will have to be used increasingly to predict advances in medical science and technology and socio-economic and demographic changes. This calls for the use of computer. A small beginning in the direction of centralised data processing has been made with children's hospital data. Every 10th discharge case-sheet is not sent direct to a computer centre for further processing, in certain oblasis of country.

H. NEED AND DEMAND FOR HEALTH, FAMILY PLANNING AND NUTRITIONAL SERVICES

1. Bains, I. : A study of nutritional status of adolescent boys and girls with different regional backgrounds residing in Delhi. Master's thesis, Delhi University, 1969.

Study attempts to determine nutritional status as related to socio-economic status of adolescent boys and girls.

2. Datta Banik, N. D., Krishna, R., Mane, S.I. S. and Lilaraj: A longitudinal study on morbidity and mortality and growth and development of pre-school children in Delhi. Indian Council of Medical Research, 1968, 86 p.

Morbidity and mortality of children born to enrolled mothers was studied by follow-up from birth up to five years of age. This growth and development was also evaluated. This study was conducted in Delhi. Sample was selected based on stratified random sampling. The investigations were carried out by a mobile team consisting of doctors, lady health visitors and social workers and studied the samples according to the schedules. Information was recorded in various proformae. Measurements for physical growth evaluation were made during house visits as well as in clinics.

Birth rate in Delhi was found to be 28.0 per thousand population per year. It was noted that most common morbidity during pregnancy was anaemia. Breast feeding was most common. The detailed picture of morbidity in different age groups of pre-school children was presented. Loss of children during five years study was found to be 537 out of 1968. Out of them 17.5 lost due to death, 340 due to shifting and 22 lost due to non-cooperation.

Physical growth study consisted of physical growth status on 1,754 live births. The morbidity picture given was of 1,948 children, but birth weight of 1,754 children was analysed as in cases of 214 children. All measurements regarding weight, height, crown-rump etc. was analysed in percentile scale and standard deviation scales.

3. Demello, E.R. and Modi, C.J., Waish, M.P. and Patel, J. C.: A nutritional survey amongst factory workers in Bombay - an investigation into the dietetic habits and the nutritional status of 20 families. Indian Journal of Medical Sciences, 1950, 4, 337 p.
4. Indian Council of Medical Research, New Delhi: Tuberculosis in India: A sample survey (1955-58), Special Report Series No. 34, Indian Council of Medical Research, New Delhi, 1959, 75 p.

The study is designed to secure data which could not only help in introducing control measures in areas and communities needing them most, but also to provide the baseline for assessing the effectiveness of these measures in course of time. The present survey was limited to pulmonary tuberculosis. Areas around six centres, viz., Calcutta, Delhi, Hyderabad, Madanapalle, Patna and Trivandrum, which had mobile miniature X-ray units, were selected for survey. This report relates to the survey covering six cities, 30 towns and 151 villages. The number of persons X-rayed was 290,758.

The salient findings of the survey may be summarised as follows: (i) prevalence rate for 'active' and 'probably active' tuberculosis varied from 13 to 25 per 1000 population in cities, towns and villages in the different zones. Prevalence rates were of the same order in cities, towns and villages and were lower for females than for males. The prevalence rates showed a continuous increase with age.

From the results of the survey it is reasonable to assume that the number of such infectious cases in the country would be at least 1.5 million i. e. 0.4 per cent of the population.

5. Indian Statistical Institute (1960): Report on Morbidity, National Sample Survey Unit, Calcutta, India.
6. Lal, R.B. and Seal, S.C. (1949): Report of the general health survey, Singur Health Centre, 1944, Government of India Press, Calcutta, India.
7. Mukherjee, B.N.: A health hazard index: A simple technique for identifying settlements which need extra health services. Central Research Cell, Pilot Research Project in Growth Centres, The Ford Foundation, New Delhi, Sept. 1973, 49 p.

A simple procedure has been described here to solve the problems of identifying settlements within a block or even a large agglomeration which run the risk of health hazard and thus, in need

of adequate health facilities. A health hazard index has been derived following a simple weighting technique on the basis of information for each settlement with respect to existing health facilities, death and infant mortality rates, accessibility conditions, total number of women and percentage of female literacy. For the sake of simplicity, the above index was obtained by weighted sum of the above variables after each one transformed to decile scores. The advantages of this technique are that it uses readily available data, does not require the use of a computer, and provides a simple method of assessing the relative level of health hazard for different settlements. Using the techniques of factor analysis and principal component analysis, it has been shown, using three different sets of empirical data that the ordering of the settlements within a block in terms of the proposed health hazard index does not vary much from the ranking of these settlements according to first principal component or composite scores obtained from the principal axis weights. The pros and cons of factor analysis as an alternative technique has been discussed. Different mathematical properties of the proposed index have also been delineated.

8. Seal, S. C. et al. (1961): Report "The short General Health Survey of the Dungarpur Community Development Block, Rajasthan, (1956). All India Institute of Hygiene and Public Health, Calcutta.
9. Idem (1962): Report on "The Short General Health Survey of the Thoubal N. E. S. Block, Manipur (1957-58). Directorate General of Health Services, New Delhi, Government of India Press, Calcutta, India.
10. Idem (1962): Report on "The Short General Health Survey" of the Rangiya Community Development Block, Assam (1957). Directorate General of Health Services, New Delhi, Government of India Press, Nasik Road, India.
11. Seal, S. C. et al. (1965): Morbidity survey of Contributory Health Service Beneficiaries (1961) Delhi, Indian Council of Medical Research.
12. Tribal and Cultural Research Institute, Hyderabad: A study on Dietary habits and Nutritional status of the Chenchus, 1972.

This study was conducted by Tribal and Cultural Research Institute, Hyderabad in 1972 with an object to assess nutrition status for the pre-school children, pregnant and lactating mothers among the Chenchu Tribes.

In this study following items have been assessed:

- a. Qualitative and quantitative intake of various food items.
- b. Cooking and feeding habits.
- c. Adequacy of existing dietary pattern.
- d. Impact of SNP on the health of pre-school children and their mother.
- e. Nutrition value of the food consumed by them.
- f. Evolving of suitable dietary pattern.

Main findings of the study are given below:

- i. Dietary intake of Chenchus does not meet recommended standard.
- ii. As an impact of SNP, the deficiencies in the case of fat and nicotonic acid are completely neutralised in all children and protein and calories among children of 3-6 years. But deficiency in case of vitamin A, Calcium and Riboflavin remains as usual.
- iii. Low or fat content may be attributed to the absence of vegetable oils and fats in Chenchu diet.
- iv. Protein-calorie malnutrition signs were mostly confirmed to the children of 1-3 years of age.
- v. Daily normal intake without SNP food is deficient particularly among lactating mothers.

Some concrete and constructive suggestions have also been made.

I. GENERAL

1. Anderson, S. : Operations research in public health. Indian Journal of Public Health, 1963, 7(4), 141-151.

Discusses Operational Research in various fields and the possibility of its starting the area of public health.

2. Anand, D. : Operational Research in health services. Paper presented in the conference organized by the Operational Research Society of India.
3. Banerji, D. : Administration of the Family Planning Programme: A plea for an Operational Research approach. Management in Government, Vol. I, No. 2, July-Sept. 1969.

The study in its quest for a scientific approach to policy formulation, implementation and evaluation of family planning programme suggests that "Operational Research" could be used in developing such a science approach to the programme. It further discusses the steps involved in applying this method and also tries to find out the type of organization which is suitable for an OR type study and the functions of such an organization.

4. Banerji, D. : Operational Research in the Field of Community Health. Opsearch Volume 9, Nos. 3-4, Sep. -Dec. 1972, pp. 135-142.

Community Health encompasses a wide range of activities including all organised efforts which are meant to prevent diseases, prolong life, and promote health and efficiency. For such activities, community health administrators have been to deal with complex problems whose solutions involve consideration of number of interacting issues. Operational research methods, techniques and tools can be used with considerable advantage to find, within certain constraints, optimum solutions of such complex problems. This has been demonstrated in the case of formulation of India's National Tuberculosis Programme. There is considerable scope for using this method in dealing with other community health problems of

India. Methodological sophistication is not always necessary for applying this approach in the field; the vital issue is to have the right scientific attitude to study the complex problems and strive to find an optimum solution. Some steps have already been initiated to apply this method in some key areas in the field of community health. Operational research tools have been used to study components of certain community health systems.

5. Bose, S. : A working report on the successful reduction of indoor occupancy in Division Hospital, Samastipur, SCAAN Journal, May 1974, pp. 10-14.

6. Bailly, G. V. J. : Operational Research in health services with particular reference to tuberculosis programme in India.

Paper presented in conference organised by the Operational Research Society of India.

7. Banerjee, D. : An Operational Research approach to India's Family Planning. Paper presented at workshop on Behavioural Indices Programme Impact, Central Family Planning Institute, 1967.

8. Dastidar, A. : Application of QMT in Laboratory in Railway Hospital, SCAAN Journal, May 1974, pp. 43-45.

This deals with the application of Quantitative Management techniques with special reference to laboratory with a view to derive optimum benefit and satisfaction for the patient, the doctor and the administration, which could only be achieved if curative services in OPD and IPD could attain most efficient standard of working in which laboratory plays a vital role. The laboratory plays an important role in assisting quick and definite diagnosis; in keeping a check on the progress of diseases toxic reactions of drugs and thereby creating confidence in the mind of patients and their relatives about the line of treatment that is formulated after full investigations. Any overcrowding in the laboratory unit will lead to overcrowding in IPD and OPD and deficiency in overall medical service. The most important factor to decide the efficiency of laboratory is the management of manpower, the team workers engaged to manage the laboratory unit.

9. Deoras, C.W., Joshi, H.L., Kondal, I.S. and Chandrasekharan, V. : Success of Industrial Engineering in Hospitals and Problems being faced. NITIE, POWAL, Bombay, Oct. 1968, 31 p.

The present study deals with the scope and utility of Industrial Engineering for improving the productivity in hospitals in terms of bringing about large-scale reduction of operations

services and improving the efficiency of work resulting in quick services to the patients.

10. Prahlad, K. : Cost Benefit Analysis is necessary. Economic Weekly, 1964, 16 (36-37), 1501-1503.

Article supports suggestion made in an earlier article in the same volumes of Journal by S. N. Agarwala that the relative emphasis on different family planning methods in India should be determined on the basis of a cost-benefit analysis, and government should keep it in mind while formulating family planning programmes.

11. Ramaiah, T.J. and Timmappaya, A. : Research in Hospital Administration in India - The need and scope, Hospital Administration - The Journal of Indian Hospital Association, Vol. 7, No. 2, pp. 105-111.

This paper looks at hospital as a system with number of sub-systems which continuously interact with and inter-dependent on each other to produce the services based on the given inputs. The delineation and understanding of the processes, components and inter-relationships that exist between them; and between inputs and outputs would eventually lead to the rationalisation of the services, optimum utilisation of the inputs, and the facilities to maximize productivity. To this extent, number of such research areas have been identified. Their role in productivity and implications for decision-making have been discussed.

12. Sinha, B. N. : Scientific allocation of beds in Wards. SCAAN Journal, May 1974, pp. 46-47.

13. Verma, S. S. : Quantitative Management Techniques in Indian Railway Medical Service. SCAAN Journal, May 1974, pp. 5-6.

The managers of the medical department are faced with a challenge to cope with the existing resources and at the same time achieve greater 'patient satisfaction'. This has called for use of all talents and techniques of modern management to improve productivity. This use of scientific methods in work management is obvious. This science is fascinating and the mathematics used is simple and within the grasp of the medicalmen. Application is easy and the result regarding time has come when the scientific approach has to be properly organised so that a large-scale improvement could be achieved in the hospitals.

14. World Health Organisation, India: The use of Operational Research in Health Services. WHO Project, India, Feb. 1970, 43 p.

This paper presents a report on the conference convened by the Regional Office for Europe of the WHO at Copenhagen to discuss the use of Operational Research in health services.

The conference had the following objectives: (i) to review the state of operation research in the development and application of health operational research; (ii) to consider requirements for the wider dissemination and application of operational research to health problems.

Accordingly the meeting split into two groups to consider: (i) Development, and (2) Propagation of health Operational Research. The first reviewed the state of health operational research and the extent of its application. The second group's initial step was to consider a strategy for propagating health operational research, realised that its purpose was changed and proposed institutional solutions.

15. World Health Organization (SEARO): Application of Modern Management methods and techniques for the improved delivery of health services. WHO, Regional Office for South-East Asia, New Delhi, November 1973, 4 p.

This is a report on the technical discussions held during the WHO regional committee for South-East Asia from 18 to 24 Sept., 1973, in New Delhi, India.

The discussions centered upon the present position of Health Services and the use of modern management methods and techniques for improving the delivery of health services.

In receiving the management of health services the participants pointed out the following drawbacks of the present health system. There is a lack of clear development policy and clear objectives for health services in relation to socio-economic development. There is poor utilisation of existing resources and inadequate harnessing of potential resources, human and other, for health; there is inadequate or no integration of preventive, curature and family planning services. There is an insufficient two-way flow of patients, information and assistance to and from the periphery, intermediate centres and the central supporting services. There is also a need to develop an organisation in the countries of the region for improved delivery of health services within the existing constraints, both financial and manpower for the masses in rural areas which alone constitute about 80 per cent of the population.

Following the discussions, the recommendations were made to strengthen the administration and management of health services

at different levels. Training in health administration and management is necessary at all levels of the organization. In-service and pre-service training should be given at all levels. Formal academic training in management is recommended for the middle-level and top-level managers. Expertise in management sciences should be available to the top health administrator.

1. Ergonomics
2. Cybernetics
3. System Analysis
 - ↳ Network + C.P.M.
 - ↳ PERT
4. P P B S
5. O R
6. C - B - A - C E A
7. W R Analysis
8. Material management



